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MACKENZIE VALLEY PIPELINE INQUIRY

Government  
Publications

IN THE MATTER OF APPLICATIONS BY EACH OF

- (a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS CROWN LANDS WITHIN THE YUKON TERRITORY AND THE NORTHWEST TERRITORIES, and
- (b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS CROWN LANDS WITHIN THE NORTHWEST TERRITORIES,

FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION, OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

November, 19, 1975.

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PROCEEDINGS AT INQUIRY

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Volume 90

CANADIAN ARCTIC  
GAS STUDY LTD.

DEC-8 1975

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APPEARANCES:

Mr. Ian G. Scott, Q.C.,  
Mr. Stephen T. Goudge,  
Mr. Alick Ryder and  
Mr. Ian Roland for Mackenzie Valley Pipeline  
Inquiry;

Mr. Pierre Genest, Q.C.,  
Mr. Jack Marshall, and  
Mr. Darryl Carter for Canadian Arctic Gas  
Pipeline Limited;  
Mr. Reginald Gibbs, Q.C.,  
Mr. Alan Hollingworth &  
Mr. John W. Lutes, for Foothills Pipe Lines Ltd.;

Mr. Russell Anthony &  
Pro. Alastair Lucas for Canadian Arctic Resources  
Committee;

Mr. Glen W. Bell and  
Mr. Gerry Sutton, for Northwest Territories  
Indian Brotherhood, and  
Metis Association of the  
Northwest Territories;

Mr. John Bayly  
or  
Miss Leslie Lane for Inuit Tapirisat of Canada,  
and The Committee for  
Original Peoples Entitle-  
ment;

Mr. Ron Veale and  
Mr. Allen Lueck for The Council for the Yukon  
Indians;

Mr. Carson H. Templeton, for Environment Protection  
Board;

Mr. David Reesor for Northwest Territories  
Association of Municipal-  
ities;

Mr. Murray Sigler for Northwest Territories  
Chamber of Commerce.

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I N D E X

Page

WITNESSES FOR CANADIAN ARCTIC GAS PIPELINE LIMITED:

A.W. Frank BANFIELD

Donald L. DABBS

William W.H. GUNN

Russell A. HEMSTOCK

Peter J. McCART

Ronald D. JAKIMCHUK

- Cross-Examination by Mr. Anthony

13571, 13667

- In Chief (cont)

13654

- Cross-Examination by Mr. Bayly

13671

- Cross-Examination by Mr. Goudge

13722

- Cross-Examination by Mr. Gibbs

13730



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony  
Yellowknife, N.W.T.

November 19, 1975.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. GOUDGE: Sir, I think we're prepared to begin. Mr. Gibbs advises me that he has about one more question, which I don't think he intends to ask, and that concerns the question related to the length of the film yesterday. It was 28 minutes, which I take it plus time for commercials, produced a number worthy of some comment. Subject to that, I think Mr. Anthony is next on the batting list.

A.W. FRANK BANFIELD  
DONALD L. DABBS  
WILLIAM W.H. GUNN  
RUSSELL A. HEMSTOCK  
PETER J. McCART  
RONALD D. JAKIMCHUK, resumed:

CROSS-EXAMINATION BY MR. ANTHONY:

Q I'll be proceeding with a few questions dealing with the vegetation aspect solely on the same procedure that's been agreed.

Mr. Dabbs, I'd like to start perhaps with getting your comments to clarify a few issues which at least to my mind are unclear, and from reading of the transcripts -- and I hope this hasn't been covered and I was unable to detect it: Do I understand your position that you presently have the ability to supply all the seed that you need for your revegetation program?

WITNESS DABBS: All of the seed that -- varieties as proposed in the set of specifications we discussed during Phase 2, yes, we



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1  
2 have that ability.

3 Q You either have them or  
4 they're within your capability to provide them in time  
5 for a reseeding program?

6 A Yes, in fact the contracts,  
7 this seed has been in production for the past two years.

8 Q Now, in setting up this  
9 program and in issuing these contracts I assume you  
10 decided what amount of the various types you need.  
11 Is that correct?

12 A Yes, we had to make those  
13 estimates in order to write such contracts.

14 Q I wonder if you could  
15 help me. If, for example, one of your species appears  
16 to perform much better than you had expected, for  
17 example, your creeping red fescues, the one that seems  
18 to be doing the job best, how much lead time do you  
19 need to increase your supply for your first seeding  
20 season?

21 A Generally acreage is  
22 put into production somewhat in excess of even our  
23 estimates, ~~our~~ conservative estimates; but if that  
24 falls short and additional requirements are needed,  
25 it takes two growing seasons before there is a harvest  
26 of seed from a grass crop.

27 Q So if in your first  
28 restoration season a particular species proved to  
29 be quite valuable to you and you wished to use it more,  
30 you would not be able to use that the following season



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 just because of a matter of supply.

2 A We also build in a fairly  
3 sizeable contingency for each of the varieties planned  
4 so that if that contingency initially, in case of  
5 failure and you have to repeat the seeding; but in the  
6 case that you've described, where something turned out  
7 very well, obviously you wouldn't need that contingency  
8 seed to patch up a failure. You would then have  
9 that extra 20 or 30% for addition to further seeding.

10 Q Now, you say you've  
11 built in a contingency. You have evaluated then the  
12 amount of seed you require of each of the particular  
13 species?

14 A Yes, and then we add  
15 20%, at least a 20% contingency.

16 Q And that's the method  
17 you have in fact implemented in the reseeding contracts  
18 you've let?

19 A Yes sir.

20 Q What is your plan in  
21 the situation where your initial seeding in an area  
22 doesn't work? Do you have to go back to these mats  
23 that we talked about, or do you intend to vary the  
24 mix in a re-attendance in that same year?

25 A Sorry, you asked me if  
26 it doesn't work some spring --

27 Q Well, your first attend-  
28 ance using a particular mix in a particular area doesn't  
29 work for whatever reason, and you have to re-attend,  
30



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 which is, I understand, your proposal. Now such  
2 re-attendance, are you able to vary the mix when you  
3 re-attend that same year, or do you have to go back  
4 and do some study of the area before you can vary the  
5 mix or know how to vary the mix?

6 A Well, I would say that  
7 the likelihood of a complete mix failing is really,  
8 really remote. That's the reason we use a mix. It's  
9 to provide that range of capabilities and what I would  
10 think might happen, we'd consider something less than  
11 successful, if one or two out of a mix of four or five  
12 would be successful and the others may not be, and  
13 the result in themselves would tell us what to do.

14 Q Now your monitoring  
15 program to determine success of the various species,  
16 is that done by on-the-ground attendance?  
17  
18  
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Banfield, Dabbs, McCart,  
Jakimchuk, Hemstock, Gunn  
Cross-Exam by Anthony

1 A Yes. It's planned to  
2 be a combination of a ground examinations, visual  
3 aerial observations and possibly medium format,  
4 photographic monitoring.

5 Q If you see a sparse  
6 growth of grass that you feel is not sufficient but  
7 there is obviously some growth going there, do you  
8 have to then attend on the ground to examine this  
9 grass to determine which species took and which -- ?

10 A Oh yes, definitely.  
11 Once you have identified an area that you have some  
12 concern for, you have to visit that site on  
13 the ground to determine just what the next steps would  
14 be.

15 Q And I imagine then  
16 have to visit at each distinct terrain type to  
17 determine whether a difference in terrain resulted  
18 in different species being successful?

19 A If you found that on  
20 each terrain type, you were not getting the measure  
21 of success you had hoped for, yes.

22 Q Now, once you have  
23 made this ground observation, are you then able to  
24 vary the mix, likely by just looking at it  
25 and say well now we have to add this species and  
26 forget about the other species or do you have to do  
27 any actual tests on the site?

28 A No, I think the judgment  
29 of experienced agrologists if you want to use the name,  
30 knowing the requirements of each variety, knowing the



Banfield, Dabbs, McCart,  
Jakimchuk, Hemstock, Gunn  
Cross-Exam by Anthony

1 climatic events of that particular season and exami-  
2 nation of the situation on the ground could make the  
3 intelligent decision as to what the next steps would  
4 be with the next combinations and what alteration in  
5 the next should be.  
6

7 Q So there except for the  
8 actual inspection, there is no lead time required  
9 between the initial seeding and the second seeding if  
10 you are going to vary the mix?

11 A No lead time required  
12 for a special study or anything like that, no.

13 Q Mr. Dabbs, on page 9 and  
14 following, you have outlined the vegetation surveys  
15 that you have carried out and you have stated the  
16 objectives of that survey which I think we can  
17 probably all agree with and I gather that from what  
18 you have said that the reason for this survey is to  
19 really gather the data upon which you make the  
20 recommendations to the engineers and others who were  
21 relying on terrain survey information.

22 A That's one of the uses,  
23 yes.

24 Q And it indicates on the  
25 top of page 9 that this survey procedure was initiated  
26 in 1972. Was the survey then done on preselected  
27 corridor or route?

28 A It was conducted on the  
29 corridor broadly of the proposed routing at the time.

30 Q Now, what were you given



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

when you started your survey to indicate the limits  
of your study?

A We were given route  
maps with the various proposed alternatives at the  
point in 1972. We were looking at a number of alter-  
natives, both the east and west side of the Mackenzie  
River for instance being one alternative. We  
were given the strip mosaics with the terrain typing  
for these routes as well.

Q And dealing with the  
North Slope, you were given both the interior -- what  
is now the interior -- and the old prime route?

A Yes, sir.

Q And, in fact, your  
Biological Report Series, in fact, deals with the old  
prime route and the interior route as well as those  
down the Mackenzie Valley itself?

A That's right.

Q And you state also on  
that page that this summer, that is, in 1975, you  
examined a new routing in the Fort Simpson area. Now,  
is this the re-alignment that was applied for from the  
spring of this last -- of 1975?

A Yes, sir.

Q And, you were similarly  
given a new alignment sheet and you conducted your  
survey over this past summer on that area?

A We reviewed the proposal  
when it was first suggested. Actually, I believe that



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

1  
2 was by the Assessment Group. And on the basis of our  
3 broad knowledge of the area, general knowledge of the  
4 area, made the comments that appeared with the refiling  
5 for the area and then this past summer, addressed our  
6 studies to that new routing, yes.

7 Q So, with respect to that  
8 alignment you made the comments which, if I understand  
9 correctly, these are the comments that appear in the  
10 environmental statement that went along with the new  
11 alignment sheet and that was on the basis of your  
12 general knowledge of the area?

13 A General knowledge and  
14 air photo studies, yes.

15 Q And following the  
16 application for that further route you then went back  
17 and did your terrain survey that you describe here  
18 over this last year?

19 A Yes, sir.

20 Q And when you say about  
21 your general knowledge of the area, do you, in fact,  
22 conduct any studies or do you have -- who gave you  
23 this general knowledge? How did you get this type  
24 of information that would enable you to comment in  
25 any detail about the advisability of that alignment?

26 A In -- I'll just check  
27 the date here -- 1973, members of my staff carried out  
28 the general survey, vegetation terrain relationships  
29 of the southern Mackenzie Valley as reported by Reid  
30 and Janz in part two of Volume Three of the Biolo-



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

gical Report Series, as I indicated, our studies though  
addressing themselves largely to a routing as shown  
on the alignment sheets went well beyond that narrow  
corridor, so we had that general knowledge really was  
a fairly -- a very good understanding of the vegetation  
terrain relationship of the old Fort  
Simpson upper Mackenzie Valley area.



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 Q And it is your opinion then,  
3 based on that amount of information which you say is  
4 recorded in those reports, you are able to recommend the  
5 Fort Simpson realignment?

6 A I don't believe we actually,  
7 in ourselves, will recommend it. We agree with it as  
8 a suitable route as discussed. From my point of view  
9 I think either routing is quite adequate.

10 Q This is a result of your  
11 report, detailed survey which you did this year?

12 A And even at the time of the  
13 refiling, that was my assessment.

14 Q And similarly with the  
15 new prime route across the Mackenzie Delta, I gather  
16 you conducted your terrain survey or your vegetation  
17 survey that you referred to on page 9, over this last  
18 summer?

19 A Yes, sir.

20 Q And your now in the process  
21 of compiling your conclusions as a result of your  
22 summer research?

23 A Yes, sir.

24 Q And you will then be in a  
25 position to advise Arctic Gas of your opinion as a  
26 result of your survey sometime this fall, or sorry, you  
27 don't know exactly know, when that report will be ready,  
28 but it is in due course?

29 A Yes, there is two stages  
30 here, of course. A report with quantitative data takes



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 time to prepare but general comments on the basis of  
3 my spending time in the field examining these two routes  
4 this past summer, I was able to make comments to Arctic  
5 Gas leading up to their decision.

6 Q And when you did this  
7 survey this summer, were you similarly given alignment  
8 sheets to indicate the route, the new prime route?

9 A Yes, sir.

10 Q Similarly you follow the  
11 same procedure of conducting terrain survey along those  
12 alignment sheets?

13 A Yes.

14 Q The process of conducting  
15 this vegetation survey that you referred to, did you  
16 also attempt to identify unique biological or terrain  
17 units?

18 A That has been a major interest  
19 to all my staff, yes.

20 Q And have you compiled a  
21 compendium on particular units that you feel are unique  
22 and are significant and made any comment with respect  
23 to them?

24 A I don't believe we have in  
25 a formalized sense, ourselves, compiled such  
26 a thing. I could say that the members of my staff have  
27 contributed significantly to the information base, if  
28 you wish, data base, for a number of the IBP sites. For  
29 instance, the proposed Firth River, the proposed Summit  
30 Lakes site, the proposed Brackett Lake site and the



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 proposed Mirror Lake site west of Fort Norman. The  
3 largest or certainly significant proportion of the  
4 information or data for those sites were given to the  
5 IBP people or people responsible for that CT section  
6 by members of my staff, so in that way I suppose we  
7 have compiled that.

8 Q And your survey, the in-  
9 structions or the terms of reference of this vegetation  
10 survey provided a mechanism to do this sort of work. I  
11 mean was this one of the issues that they were to direct  
12 their minds to?

13 A Not in a formalized sense.  
14 The nature of the sample and program in itself, lends  
15 itself to generating this kind of information.

16 Q Could you similarly identify  
17 or attempt to identify any recreational or potential  
18 recreational areas and identify them?

19 A That is, not being in our  
20 terms of reference and I have never made any recom-  
21 mendations with that regard.

22 Q In any of the studies you  
23 have conducted on right-of-way clearing of the affected  
24 terrain, have you also examined the question of snow  
25 depth and how clearing would affect the snow depth  
26 along the right-of-way?

27 A Not on a broad scale. As  
28 part of the surveys it was of interest. As part of the  
29 studies at the test site at Sans Sault, the depth of  
30 snow and the influence it has on ground level temperatures



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 because that's an important piece of information in  
3 the survival of anything growing on that right-of-way.

4 Q I think we touched earlier  
5 I believe, on the question of temperature and the effect  
6 and I would like to deal now with the question of depth  
7 of snow. Have you come to any conclusions, on the basis  
8 of your experience, as to the effect of the right-of-way  
9 on snow depth within the right-of-way itself?

10 A No, I wouldn't say that I  
11 have.

12 Q On the basis of your ex-  
13 perience, would you agree that the snow would likely  
14 be much deeper over the right-of-way, that it would  
15 act almost as a snow fence in some cases?

16 A Within forested areas, I  
17 wouldn't think that there would be significant increase  
18 in depth of snow because there is very limited drifting  
19 obviously. The snow falls generally straight down.  
20 There could be some drifting on the right-of-way, but  
21 it would have to be snow that has fallen directly on it  
22 so that shouldn't change the amount of snow accumulation  
23 within forested areas. I could foresee some drifting  
24 and snow build-up in open areas in the tundra region .  
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Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

Q With the question of snow and the question of snow roads in particular, now have you as a result of your terrain studies come up with a list of recommendations and criteria for these snow roads? When do you discontinue use of snow roads?

A I wouldn't say I have prepared a list of criteria. I believe it's fair to say that my recommendations would be those that someone like Dr. Clark might make, and in other words once snow thaw or spring thaw reaches a point where there is a danger, during daytime operations, of breaking through a prepared snow road resulting in damage to the underlying organic cover, at that point I would suggest that the road be used only during night-time or freezing periods and that's quite obvious then to engineers that the lifetime of that road is coming to an end.

Q But when you use the phrase of "a danger to damage to tundra", you circled on the issue but it doesn't help you very much. What do you mean by "damage to the tundra"?

A Physical tearing or removal due to movement of machinery, equipment would result in its severe compaction or actual tearing it away from the ground surface.

Q So you're satisfied and your recommendations to Arctic Gas are that as long as it doesn't rip away the organic layer or start ripping away the organic layer, the snow road is



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 properly in place it can properly be used.

2 A Or some significant  
3 compaction. If a two-foot layer of organic material  
4 compresses six inches , that in itself is going to  
5 result in increased depth of thaw, so the two together.

6 Q Have you given any more  
7 specific criteria what you mean by "significant  
8 compaction"?

9 A Yes, I described I think  
10 that I would consider compaction from a thickness of  
11 two feet to six inches a significant compaction  
12 which we would forecast ourselves would result in  
13 increased depth of thaw, and people like Dr. Slusarchuk  
14 could calculate that for you.

15 Q We may all agree that  
16 if you do a two-foot organic layer to six inches, you  
17 may have some problems; but the question comes of what  
18 sort of guidelines you would provide? You may very  
19 well have those same problems if you have a two-foot  
20 compaction to a foot and a half.

21 A Well, I couldn't myself  
22 give guidelines or instructions on a specific quantitat-  
23 ive basis because my field is not one of thermal  
24 analysis which we work with. Dr. Slusarchuk and  
25 Dr. Clark are the people who could set the very objective  
26 criteria in terms of whether or not a compaction of  
27 two feet or one foot is going to result in unacceptable  
28 increase in depth of thaw.

29 Q But you've got to be  
30 satisfied that the terrain underneath that snow road



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 is not so damaged that your revegetation program is  
2 ineffective.

3 A Quite true, that is a --

4 Q If you've got a concern  
5 on that terrain, I'm wondering what you've recommended  
6 to ensure that the areas that you're concerned with  
7 are adequately protected?

8 A I quite agree with what  
9 you're saying, but in terms of setting <sup>quantitative</sup> <sup>guide</sup> lines  
10 for Arctic Gas, it's not within my realm of  
11 capability of setting those firm guidelines.

12 Q Would you not recommend  
13 that you have an input into this decision?

14 A Oh, we do and we have  
15 as part of our assessment of that Inuvik snow road  
16 test.

17 Q Yes, I appreciate that.  
18 I'm thinking in terms now of the actual construction  
19 mechanism as you move to final design. Do you not  
20 feel you have a role to play in determining the use  
21 of snow road and what criteria should be applied so  
22 you can decide when you stop using it or start using  
23 it and so on?

24 A I believe we will  
25 definitely have that involvement as we move to the  
26 final design stage, and my recommendations are simply  
27 going to be those of protection and not the setting of  
28 absolute objective criteria.

29 Q Well, Mr. Hemstock, how  
30 are the criteria going to be prepared in the terms of



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 environmental protection as instructions to the  
2 engineers?

3 WITNESS HEMSTOCK: Well, the  
4 criteria are aimed at protecting the terrain, and I  
5 suggest that the first evidence or criteria that  
6 Mr. Dabbs referred to is the critical one; that we must  
7 make sure that there is an adequate snow road over  
8 the organic material to protect it. The business of  
9 compaction of the organic layer, I think, is more a  
10 hypothetical situation because the snow road will not  
11 be built until there is sufficient frost in the ground  
12 to prevent this, and as long as the snow is intact  
13 over the organic material on the snow road, we will  
14 not get that compaction. So if we simply have, as a  
15 criteria, that there be no traffic over any snow road  
16 without an adequate pavement, that to me is sufficient.

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Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

Q I agree that the  
ultimate objective is to have an adequate snow road  
but I think that my discussion with Mr. Dabbs indicates  
that if there at least two elements in determining  
whether or not a snow road is adequate.

Number 1 is whether  
it rips up the terrain and secondly whether it  
results in any compaction. Now, the engineers are  
going to look to the environmentalists for some advice  
as to when they can start using it.

A I suggest that there is  
only one and that is that there be protection provided  
to the surface that the business of compaction will  
not occur with the way that the snow roads are built.  
First you must have adequate frost penetration in the  
fall before you build them. It is certainly not going  
to thaw under the snow pavement and you are not going  
to have this compaction.

Q Okay now, your advice  
is then as the environmental consultant. that in  
dealing with the issue that you admitted as identified  
as being significant, the question of their ripping  
up of the terrain. Do I understand your advice that  
a snow road is adequate from your point of view  
provided it does not rip the terrain. That's the test  
that you are going to apply?

A Yes, provided there is an  
adequate pavement to prevent break-through of wheels  
or tracks onto the organic material itself and the



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

moment that happens, there should be no further  
traffic on the snow road.

Obviously we're going  
to have good warning of that as the weather warms up  
in the spring. And we would have to have the scheduling  
for the removal of all of the equipment from the  
right-of-way before that time or as Mr. Dabbs points  
out if you see that happening then it has to be moved  
out during the freeze-up period at night.

Q Is there any other test  
besides the breaking through so that you are ripping  
the terrain? Is there any other test that you wish  
to apply as an environmentalist?

A No, sir. There have been  
other tests suggested which, such as measuring the  
hardness of the pavement and so on. I think that  
they may be good academically but the real principle is  
to see what is happening to the surface and as soon as  
it starts to break up, that should be the end of the  
traffic.

Q Okay, how are you going  
to ensure that that test is enforced?

MR. MARSHALL: There has been  
endless evidence about this, Mr. Commissioner. Mr.  
Longlitz was here and gave evidence, was cross-examined  
at length. It's clear this is something that is  
regulated by established governmental authorities.

MR. ANTHONY: Well, I believe  
that's so. I'm not -- I believe that the criteria now.



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

1  
2 We've established the test. Now, I am just trying to  
3 get an idea how an internal mechanism within Arctic  
4 Gas, the use of people like Mr. Holt and Mr. Dabbs  
5 and other people within Arctic Gas are going to be  
6 used to enforce these.

7 WITNESS HEMSTOCK: A There  
8 will be environmental inspectors on each spread.

9 Q And that would be one  
10 of their responsibilities then, to check into advising  
11 them.

12 A Absolutely.

13 Q Now, to get back to you,  
14 Mr. Dabbs, in Mr. Jakimchuk's statement yesterday, he  
15 again pointed out the fact that had been alluded to  
16 at other times that caribou tend to migrate or can  
17 tend to migrate along a cleared right-of-way. Now,  
18 this, I think you would agree with me, would result  
19 in a certain amount of trampling of the terrain along  
20 the right-of-way. Now, have you examined the effect  
21 of this on your re-vegetation program?

22 WITNESS DABBS: A The  
23 trampling effect the caribou have is certainly demon-  
24 strated throughout the -- anywhere in the northern  
25 Yukon. The trampling observations that I have been  
26 able to make have been restricted largely to the test  
27 plots near the Firth River that I illustrated two weeks  
28 ago in my slides. And, that hasn't yet turned out to be  
29 serious in that case. However, I<sup>would</sup> say that if the  
30 interior route was built, the opening -- the forest



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

opening that the right-of-way would represent every spring could result in their movement on it for some distance and I couldn't even begin to guess what that distance might be. This could certainly lead to severe problems with trampling and tearing up or setting back of the re-vegetation program.

On the coastal route, the northward migration isn't likely to result in too much trampling because it's an open tundra situation.

I would foresee that in the post-calving time as illustrated yesterday, in the congregation of caribou that move back across the border. At the time, early summer, that we could encounter some severe problems of trampling by caribou. In fact, I've kidded these guys all along. I think the greatest impact would be the caribou on the pipeline rather than the pipeline on the caribou.

Q Now, given that as your professional opinion then, can we -- can I ask you whether you are studying these effects in your re-vegetation studies?

A The opportunity for such direct observation has been, as I said limited and the best I think we can offer will be a very close monitoring of the situation and being prepared to return to those areas where they've trampled it to a point where it would require additional or reseeded. Then perhaps we might consider, although I don't think I have ever made the recommendation, on the few river



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

1  
2 banks where the trampling could lead to severe erosion,  
3 that for the one or two years, perhaps a small fencing  
4 or just a simple rope and flagging might be con-  
5 sidered to keep them off a few hundred yards of hillside  
6 until that hillside is firmly stabilized. Otherwise,  
7 their trampling over most of the North Slope is  
8 relatively a level terrain and it wouldn't lead to  
9 an erosion problem. It would be a matter of returning  
10 that fall or the following spring to seed those areas  
11 that were severely trampled.  
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Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 Q Any other recommendations  
2 other than a possible caribou detour?

3 WITNESS DABBS: I think I just  
4 mean that. Another one perhaps, and I think it's  
5 important, that would be restricted and everyone  
6 understands that that would be restricted to very short  
7 sections of only a few limited hills. Other than that,  
8 I would prefer to return to seed an area rather than  
9 suggest anything like driving them off, I don't think  
10 that would be an acceptable suggestion at all.

11 WITNESS JAKIMCHUK: May I  
12 interject here for a moment just to provide a little  
13 bit of clarification? We have looked at that  
14 problem right from the outset of our studies, or that  
15 as a potential problem and as a consequence generated  
16 some information as to what caribou actually do when  
17 they encounter a right-of-way or a simulated right-of-  
18 way, which in that case was a seismic line in a forested  
19 area, and we've got some information on that indicating  
20 that they will not be deflected by<sup>a</sup> right-of-way.  
21 They will utilize it, providing it is in the direction  
22 of their travel; but if their angle of approach is  
23 any greater than even 45 degrees, they will simply  
24 cross it. But being concerned about this, we made  
25 a recommendation, for example, in 1971. In the course  
26 of summer movements it's very evident of the damage  
27 that caribou do on the tundra when they move in large  
28 aggregations, in large numbers, and there was an  
29 alignment that went through<sup>a</sup> very broad valley between  
30 the Malcolm and the Firth Rivers that was used by



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 60 or 70,000 caribou and is frequently used. We recom-  
2 mended that the alignment be moved out of that valley,  
3 and it was in fact moved northward, so that what I  
4 really anticipate with respect to Mr. Dabbs' problem  
5 is that if an erosional problem occurs, owing to  
6 caribou, it will likely be very localized and rather  
7 than a very linear movement along the line, they will  
8 likely be localized in a place where there is a con-  
9 centrated movement across the line.

10 Q All right, I don't want  
11 to get too much into the caribou, but perhaps we should  
12 follow this point through while Mr. Dabbs is here.  
13 Am I not right in my understanding of Dr. Bergerud's  
14 position, for example, that there may very well be  
15 some variation to follow a parallel movement of a right-  
16 of-way? In other words, the possibility of the  
17 caribou following the line for some distance, I'm not  
18 saying the whole line but I'm saying that for at least  
19 some distance, is a very distinct possibility and is  
20 a potential problem that Mr. Dabbs would have to face?

21 A Well, this can get into  
22 quite a lengthy discussion, but I would say that based  
23 on the information that we have acquired, this possi-  
24 bility is quite unlikely that there would be that type  
25 of a long movement along the line even for a matter  
26 of a mile; with respect to the coastal routing. The  
27 main significance or the main reason that caribou do  
28 follow corridors is related to snow depth and snow  
29 conditions in the surrounding area, and the time at  
30 which the damage would most likely be done during the



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

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2 banks where the trampling could lead to severe erosion,  
3 that for the one or two years, perhaps a small fencing  
4 or just a simple rope and flagging might be con-  
5 sidered to keep them off a few hundred yards of hillside  
6 until that hillside is firmly stabilized. Otherwise,  
7 their trampling over most of the North Slope is  
8 relatively a level terrain and it wouldn't lead to  
9 an erosion problem. It would be a matter of returning  
10 that fall or the following spring to seed those areas  
11 that were severely trampled.

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Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 summer movements, there is no snow factor which would  
2 encourage them to utilize the right-of-way.

3 Q I don't want to be accused  
4 by my friends of going into the caribou when we said  
5 we would be talking about vegetation, but I --

6 MR. MARSHALL: Help yourself.

7 MR. ANTHONY: Thank you.

8 Dr. Banfield, I think, wanted to add some comments.

9 WITNESS BANFIELD: But with  
10 reference to your reference to Tom Bergerud's work,  
11 Bergerud worked in Newfoundland and he was speaking  
12 of a heavily forested area and there is a problem  
13 there of caribou following parallel routes in a forested  
14 area, but in the alignments that we're looking at,  
15 this risk isn't there. There is no migration route  
16 along the Mackenzie Valley, for instance, and the risk  
17 would be, on the prime route, would be along the tundra,  
18 completely tundra area where you reach the caribou  
19 range and there there wouldn't be any attraction for  
20 a simple route lacking the forest corridor concept.

21 Q Well, I think we may  
22 well get into this discussion when we get into the  
23 caribou panel as a whole, but do I understand then  
24 that as a result of the <sup>very</sup>able advice you received from  
25 Dr. Banfield and Mr. Jakimchuck that you are satisfied  
26 that it's not a problem and therefore you're not  
27 proposing to conduct any studies into this?

28 WITNESS DABBS: I'm satisfied  
29 that the steps I have outlined will quite adequately  
30 deal with the situation, as my associates



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 assisted me in coming to that conclusion.

2 Q If by some miracle they  
3 were wrong, what could you do if there was -- what  
4 mechanisms or techniques are available to you to  
5 prevent erosion or to deal with terrain problems if  
6 there was migration for even a short distance, or as  
7 Mr. Jakimchuk suggests, across the line?

8 A It would simply require  
9 a ground maintenance crew going out and reconstructing,  
10 if you wish, the physical erosion control features  
11 that have previously been discussed before the Inquiry  
12 and our returning to the site and reseedling it.

13 Q Now, if as a result of  
14 a spring movement across your line, there was a trampled  
15 crossing of whatever length, and you were to reseed it  
16 in the -- following the migration, do you have any --  
17 what is your advice as to whether or not that reseedling  
18 would adequately protect the terrain during the next  
19 migration, assuming they followed roughly the same route?

20 A Well, maybe my associates  
21 here could comment, but my understanding is that the  
22 likelihood of them passing within the exact precise  
23 spot is, in a large group, is quite remote, but if they  
24 insisted on going over the same area repeatedly within  
25 some few hundred yards, year after year, then I would  
26 suggest we implement caribou fences.

27

28

29

30



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 Q I don't know whether this is  
3 a grass question or a caribou question but I would like  
4 to find out whether or not you have studied the question  
5 of whether caribou will dine on these exotic species  
6 that you are going to be planting along the right-of-way.  
7 Has this been examined?

8 A I would have to take exception  
9 with your word exotic.

10 Q Sorry, I didn't mean it in  
11 the agronomic species that you--

12 A But irrespective of what  
13 species you are using, some measure of fertilization  
14 will be required to establish them and in so doing, of  
15 course, the protein content, forage value of the grass  
16 is quite good and observations at Prudhoe Bay, some  
17 that my own staff have made on some of the rig sites  
18 that have been seeded, is that they will eat it.  
19 Depending on the nature of the grass, such as some  
20 that we have used on rig sites, once a root system is  
21 established they recover immediately.

22 Q My understanding is not only  
23 will they eat it, but they will prefer it. Is that what  
24 your information indicates?

25 A I would say that at certain  
26 times of the year, their summer movements at least in  
27 the Prudhoe Bay areas, they preferentially select the  
28 grass, yes.

29 Q Well, have you studied this  
30 beyond, you know, the comments that you have made. Have



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 you examined, for example, how much they would have to  
3 take off before they would effectively retard your  
4 restoration program?

5 A I think the one point that  
6 should be remembered here, that was mentioned in the  
7 film yesterday and repeated by my associates, the very  
8 nature of the animal is one of continuous movement and  
9 grazing. That is an adaptation that they have evolved  
10 to prevent over-grazing of the range and I think there  
11 is every reason to believe that their natural feeding  
12 behaviour is not going to change just because there  
13 happens to be a little grass out there and that they  
14 will graze, but they will also carry on and graze else-  
15 where.

16 However, if you recall that  
17 one of the points I made in favour of a tundra stripping  
18 replacement program, is that it will reestablish the  
19 same plants over the right-of-way and thus reducing the  
20 attractiveness of the right-of-way for caribou grazing  
21 as I have observed in our plots in the Firth River where  
22 we have a mixture of the indigenous tundra species and  
23 the seeded grass where there has been no preferential  
24 feeding there, even though/<sup>thousands of</sup> caribou have crossed there  
25 in the last three summers.

26 Q So, your opinion is that  
27 they won't dally at this grass, in any event, or even  
28 the fact that there are a large number of them, it won't  
29 result in such a reduction of the grasses that you will  
30 be introducing, to destroy or limit or retard your



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 restoration program?

3 A Being as objective and  
4 realistic as I can about it, I would myself, yes, that  
5 there could be areas, there could be spots along the  
6 right-of-way where the grazing and the trampling combined  
7 could retard the restoration program. Yes, it will  
8 require close monitoring and be prepared to enact a  
9 reseeding program.

10 Q Now, while your fence or  
11 whatever possible techniques are available to you and  
12 they keep the caribou off an area, how do you keep  
13 Dr. Gunn's birds off the area?

14 A I think again, it is a  
15 situation where we will live with it. The geese will  
16 probably feed on the grass as they will feed on the sedge  
17 bordering the right-of-way as they will feed across the  
18 Slope. As the slides show yesterday, in some places  
19 they will eat it down pretty bare in some spots but  
20 they are small spots and they are moving ahead all of  
21 the time. I think it's a-- I don't think it's a  
22 situation that will become terribly serious to the overall  
23 success of the re-vegetation program and I would suggest  
24 that it is something we will live with rather than  
25 attempt to drive them out. I don't think that would be  
26 an acceptable suggestion.

27 Q Now, how do you live with  
28 that then? Thinking now of these flocks of birds that  
29 come by and see this strip of freshly layed grass seeds  
30 down below, how do you live with that if your not going



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 to chase them away?

3 A I don't think they will feed  
4 in such concentrations over that large an area for that  
5 long of time that they will wipe it out. It is just not  
6 in their nature to completely wipe out the grazing, their  
7 source of food and we live with it by simply spot seeding  
8 from time to time where they happen to concentrate.

9 Q Well, I am going to get into  
10 trouble again but Dr. Gunn could you perhaps comment on  
11 that? I guess we are really asking you, without getting  
12 into any great detail whether or not, from your pros-  
13 pective and knowledge of bird feeding habits, that a  
14 strip of grass seed lying over an area perhaps tradi-  
15 tionally used in some ways by birds, would result in  
16 feeding on that area.

17 WITNESS GUNN: I think that  
18 they will probably investigate it. It would be something  
19 new to them. They might investigate it but traditionally,  
20 their tradition would be to feed on the sedges and  
21 berries that they have been obtaining all along and I  
22 don't think that there will be enough of this to make  
23 a significant contribution to their food requirements  
24 and it will be probably a small part of their food  
25 requirements and that the overall damage to the vegetation  
26 is likely to be quite small.

27 Q But, in dealing with an area  
28 and I give a specific, where the right-of-way is re-  
29 latively near to traditional feeding grounds for snow  
30 geese for any other bird population, could you anticipate



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 that they may very well eat off the seed in that par-  
3 ticular area, though it may be a very small percentage  
4 of their total requirements, but may also be the total  
5 seed that is exposed at that location?

6 A Well, when your using the  
7 term seed, by the time that the geese get there in late  
8 August and September, you are dealing with growing  
9 plants, right?

10 Q Okay, well that's right.  
11 That's one problem but I am thinking in terms of either  
12 a reseeding program or whatever the situation is.

13 A I don't think the geese  
14 would eat the seed, in any case, if you reseeded it.  
15 They are grazers. They go after the green sedge and  
16 grass vegetation. I don't think they are interested  
17 in seed per se.

18 Q All right. Now, what happens  
19 now is that grass is grown on the right-of-way, because  
20 Mr. Dabbs first seeding has proved successful and  
21 there is this nice freshly grown grass existing  
22 across the right-of-way, would you anticipate they would  
23 stop to graze on that?

24 A I think they might sample  
25 it but in the overall area where they are feeding,  
26 it's a very small porportion of the area that they are  
27 using and I don't think they are going to, by any means,  
28 try to feed exclusively on that.

29 Q No, I can appreciate they  
30 wouldn't feed exclusively on it. I am wonder whether or



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 not you could foresee the possibility of them grazing  
3 off a particular area along the right-of-way?

4 A Even if they did graze it,  
5 I think it would come back successfully the next year.

6 Q Okay, so we will go back  
7 you  
8 to/then Mr. Dabbs. When they have grazed it off, what  
9 can you do during that year?

10 WITNESS DABBS: Well, if you  
11 want to create a situation that I don't really think  
12 will exist where they completely eat all of the grass  
13 off a strip of right-of-way, we would simply seed that  
14 again the following spring.

15 Q But they don't have to eat  
16 all of the grass and they don't have to eat it off the  
17 whole right-of-way to cause potential erosion problems.  
18 You would agree with me on that, would you not?

19 A Yes, on limited sections,  
20 that's quite right.

21 Q And if that does occur, there  
22 is nothing but reseeding the following year that's  
23 available to you and you would have no other recommendations  
24 to make?

25 A Well, I think putting the  
26 whole erosion control thing back in perspective here  
27 then, you recall the evidence given by Dr. Clark and his  
28 associates, is that the physical drainage and <sup>erosion</sup> control  
29 plans or designs are based on the assumption that they  
30 will not be able to count on plant cover for the first  
four to five years. I think that is a generous time



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 period but it's a very conservative one in that respect.  
3 And if the geese were to eat all the grass off a slope  
4 approaching to a, an approach to a stream for instance,  
5 where there is a potential for erosion, the physical  
6 techniques for erosion control/<sup>that</sup>would have been implemented  
7 by the engineers would not be affected.

8 Q And you would not think it  
9 essential then to ensure that restoration program at  
10 that area and you can live with the fact that in that  
11 area re-vegetation will be retarded and continue to be  
12 retarded because of these other techniques?

13 A I think we take the position  
14 that any number of factors, including the ones we have  
15 discussed here plus climatic ones, can result in a  
16 setback of our re-vegetation program and that's the  
17 reason for the conservative design and if it happens  
18 that geese consume enough grass off a hillside that it  
19 results in an erosion potential, it will be reseeded and  
20 the likelihood of them repeating year after year after  
21 year on one particular hillside seems so remote it is  
22 hardly worth theorizing on.  
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Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 Q We turn then to the ques-  
2 tion of the use of methanol and the effect of methanol  
3 on terrain and terrain vegetation, and I gather from  
4 what you have said in your evidence that you have no  
5 objection to the use of methanol as a testing fluid  
6 on the right-of-way as a result of your analysis of  
7 potential damage that methanol might cause to terrain?

8 A Well, in terms of an  
9 objection, firstly to be used on the right-of-way and  
10 it's to be used in testing of the pipeline itself,  
11 I accept the fact that some freeze depressant will have  
12 to be used for hydrostatic testing and methanol seems  
13 to me to be the most acceptable of any of the freeze  
14 depressants suggested.

15 Q And have you made any  
16 recommendations with respect to its use or have you  
17 done any study on the impact of methanol, of a methanol  
18 spill on the right-of-way -- vegetation of the right-  
19 of-way?

20 A The studies that have been  
21 done are those that I have alluded to in my testimony,  
22 and have been reported in at least one report on the  
23 effect of winter methanol spills, at the test-site  
24 near Inuvik.

25 Q Well, let's look at that  
26 report then which you have before you and see what  
27 that study tells us and how instructive it is.  
28 First of all, I think you will find, do you not, that  
29 the study was conducted on a 20% methanol solution  
30 rather than on pure methanol. Is that not accurate?



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1                   A     That's 20% by weight  
2     yes, as suggested by the engineers to be about the  
3     concentration which would be used in testing.

4                   Q     And that's during the  
5     test itself, but now methanol is going to be stored  
6     -- pure methanol will be stored along the right-of-  
7     way in these bladders prior to and subsequent to  
8     testing. Is that -- that, I think, is the advice  
9     we got from the engineers that methanol will be on  
10    the right-of-way and will be handled in its pure form.

11                  A     That's my understanding,  
12    right.

13                  Q     Now, have you done any  
14    studies of the effect of methanol, undiluted methanol  
15    on the terrain?

16                  A     I believe that that has  
17    been incorporated into some of the recent studies  
18    which have not yet been analyzed or reported on.

19                  Q     So that hasn't been  
20    studied to date, or that is part of the study that  
21    you're proposing to conduct; is that my understanding  
22    of your --

23                  A     I believe, and I would  
24    have to check this with Dr. Younkin, but I believe that  
25    there have been plots with greater concentrations of  
26    methanol actually put in this past year.

27                  Q     Well, since you are going  
28    to be having pure methanol on the right-of-way, would  
29    you not recommend that such a study be conducted?

30                  A     Yes, I recommended it.



Panfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 What I'm saying is I also believe that we have at least  
2 started this study, and if not, it certainly would be  
3 part of this winter's.

4 Q Now I understand that this  
5 that  
6 methanol/was used in this study referred to on page  
7 17 was prepared by the Fisher Scientific Company.

8 Can you tell me whether or not that is the industrial  
9 strength type of methanol that will be used, actually  
10 used on the right-of-way? Or do you know?

11 A Well, it's 95% pure  
12 methanol and as far as I'm aware, that's the methanol  
13 that would be used or would be transported and used.

14 Q Now, the study that  
15 you've referred to also was conducted during February  
16 in the time of obviously deep winter when the active  
17 layer was entirely frozen. Is that your understanding  
18 of the study also?

19 A Yes.

20 Q And of course methanol  
21 is going to be used and going to be stockpiled at times  
22 throughout the summer. Have you done any studies of the  
23 effect on the terrain of a methanol spill in summer?

24 MR. MARSHALL: You mean the  
25 effect on vegetation?

26 MR. ANTHONY: Yes, the effect  
27 on vegetation, and dealing now obviously with Mr.  
28 Dabbs' experience, and that's the effect on vegetation.

29 A No, we have not had a  
30 summer study because my understanding is that it would  
be transported in place and handled in a very careful



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 manner and stockpile sites where the same type of  
2 protection against spills as would be implemented  
3 against fuel spills would be employed so that the  
4 probability of a summer spill on vegetation is, I  
5 don't believe even exists, but maybe it does.

6 Q Well I think we can  
7 perhaps take it, if not on the basis of experience,  
8 at least to ensure some sort of contingency planning  
9 goes on, that there is a possibility of an accidental  
10 spill of methanol. Now would you not then recommend  
11 that some form of summer study also be conducted  
12 to determine the effect of methanol on vegetation?

13 A I think on the basis of  
14 the literature and the experience we've had testing  
15 the effect of methanol on living plants in a greenhouse  
16 an actual field summer study of the effect of pure  
17 methanol on vegetation would be unnecessary. The answer  
18 is if pure methanol comes in contact with living plants  
19 it's going to kill them. That's the reason for the  
20 very stringent plans for its transportation and storage.

21 Q So you would at least  
22 go with me this far as agreeing that a spill of  
23 methanol in the summer would have a much more devastat-  
24 ing effect on vegetation than a spill in winter.

25 MR. MARSHALL: Well, he didn't  
26 say that.

27 MR. ANTHONY: Well, I've asked  
28 him whether he would go as far as -- that far in  
29 agreeing with me.

30 A Devastating inasmuch as



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 it obviously I would predict would kill the plants that  
2 it comes in contact with, the probability of that  
3 affecting the plants on a large scale in a broad  
4 area doesn't exist.

5 Q Are you saying that  
6 you don't recommend a study of a summer methanol  
7 spill because you think it will never happen?

8 A No, because I think we  
9 know what will happen.

10 Q And the result would,  
11 you anticipate much more -- if I don't use the word  
12 "devastating", you object to that -- much more  
13 I'll use the word "catastrophic" but that doesn't help  
14 you very much, does it?

15 A No, I don't object to  
16 the word.

17 Q It will have a much  
18 greater effect on the terrain if it happened in summer  
19 than if happened in the test situation that you've  
20 referred to, of a winter test.

21 A That would be my expect-  
22 tation, yes.

23 Q Now, another element  
24 of your test is, as I understand it, the test was  
25 conducted by sprinkling with water, by sprinkling  
26 methanol all over an area, with a watering can.  
27 Now that doesn't particularly correspond to what would  
28 happen if there was to be a methanol spill in actual  
29 practice. There would be a washing over of the terrain  
30 by a bladder bursting or a test-pipe section letting



Banfield, Dabbs, Gunn  
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1 loose.

2 A Well, this initial study  
3 was one set up to give us a/ <sup>first</sup> evaluation of the effect  
4 of a slow leak, a small failure in a weld, a small  
5 failure in a seam would result in some solution  
6 reaching the ground surface. That would be my  
7 expectation, although it could also just remain in  
8 the ditch, I would think, and it's not necessarily  
9 a situation of flooding an area or washing an area  
10 over in that case as described. Additional plots  
11 put in this past winter were just -- or sorry, or  
12 a year ago or nearly a year ago, larger quantities of  
13 methanol, methanol solutions were applied just as  
14 you suggest in a washing over of the plots.

15 Q But that's what in fact  
16 would take place in practice, would be a washing over  
17 of the area downstream of a pipeline break or a break  
18 in the bladder, of the storage bladder.

19 A A major failure in the  
20 line or a break in a storage bladder, yes, / <sup>that's what</sup> I would  
21 expect.

22 Q And this study didn't  
23 focus on that problem then either.

24 A No, not this first one,  
25 no. Subsequent studies have.

26 Q And are the studies  
27 you're conducting over, this summer intended to look  
28 at this problem in that context?

29 A Yes sir.

30 Q Now also the study is dealt



Banfield, Dabbs, Gunn  
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Cross-Exam by Anthony

1 with one terrain type, the black spruce heath. Why  
2 was this terrain used as the test-site for the methanol  
3 study relied on?

4 A It's representative of  
5 the type of vegetation terrain you find from Inuvik  
6 to -- as far south as Norman Wells, and it's represen-  
7 tative of the major type vegetation.

8 Q You agree it's not the  
9 most vulnerable terrain type found along the route.

10 MR. MARSHALL: What do you  
11 mean by "vulnerable"?

12 M R. ANTHONY: Vulnerable to  
13 damage by methanol.

14 A I don't know that I could  
15 say that that's not the most vulnerable, or whether it  
16 is the most vulnerable to methanol because I don't  
17 think anybody knows. That's the intent of expanding  
18 this program into tundra areas. I think many of the  
19 same plants we're discussing in this report, in fact  
20 a very large percentage of those plants you will find  
21 again in tundra areas. You may not have the black  
22 spruce, though. In fact the initial study area probably  
23 gives us a greater diversity than strictly a tundra  
24 test-site.

25 Q And the study you're  
26 going to be conducting, does it include a study of  
27 various terrain units, for instance tundra and taiga?

28 A I don't think we are  
29 looking at a variety of terrain units, but we are  
30 looking for a test within treeless tundra, if you want,



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
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1 this study as reported here is what you might refer  
2 to as taiga or forest tundra.  
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Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
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Q But the studies that you  
are proposing to conduct to determine the effect of  
methanol on vegetation, it is going to include examination  
of other terrain types?

A I think the important thing  
is the plant species themselves and not the terrain types.  
Black spruce re-occurs on a multitude of terrain types  
but the reaction of that species to methanol isn't  
going to change just because it happens to be on an  
outwash plain or on a glacial lake basin type of  
land form or the response of Labrador tea as a species  
is what is important, not whether or not you find that  
in the complete variety of terrain types.

Q I didn't mean to --

A So our interest is to  
find the -- determine the effect of methanol on other  
or additional plant species.

Q Right.

A That's the intent of  
the program, yes.

Q And that will be conducted  
in the future studies that you have referred to.

A Yes, sir.

Q Now, the study you have  
also -- that you have relied on also was a one-year  
study determining the amount of dead plants that  
resulted as a result of the application of methanol.  
Now, you would agree with me, would you, that the  
need for some long term study of the effect of methanol?



Dabbs, McCart, Hemstock, Gunn,  
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Cross-Exam by Anthony

A The same plots were  
re-sampled this, for instance, this past summer.

Q And have you come to any  
conclusions on the long-term effects of methanol at  
those concentrations?

A Conclusions, I think  
would be those that were actually predicted to you  
that if these concentrations, the recovery is pro-  
gressive of these plants.

Q And the study that you  
have done this summer or the further work that you have  
done this summer confirms these conclusions of 1974  
that there will be progressive recovery?

A Yes, I think that would  
be the conclusion.

Q Well, as I understood it  
you went back this summer and tried to confirm the  
conclusions that were in the report of 1974, that  
said recovery will probably take place. Now, you  
have gone back a year later and has recovery taken  
place in the way and in the -- that is suggested in  
that report?

A Yes, I think that's  
what I said. The recovery is progressive. There's  
more and more recovery.

Q You have verified the  
suggestion made in 1974 that recovery would take place  
over those plots?

A Yes, that's what I'm



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
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saying.

Q And have you found any  
further damage or damage that did not appear after the  
first year taking place now that you have gone back  
the second year?

A Not that I'm aware of. I  
don't believe we've found anything like that.

Q What about the test of  
other toxic chemicals such as crude oil, fuel oil and  
synthetic lubricants? Have you conducted tests . .  
dealing with possible spills of these toxic substances?

A Not ourselves because  
there has been a quite number of people carrying on  
these types of studies, sponsor -- programs sponsored  
by the Environment Social Program as reported and  
projects reported by Bliss and Wein for instance, as  
funded by Allure I believe. There has been a lot of  
research in this field and we didn't find it necessary  
for ourselves to repeat it.

Q As a result of your  
review of this literature, could you tell me what the  
result on the active layer is of a fuel oil spill?  
Does it destroy the active layer?

MR. MARSHALL:

Well, how much -- what  
type of terrain and so on, surely the variables are  
incredible. Weather conditions, --

MR. ANTHONY: Well, I don't --  
I can get into specific examples if you want. I thought  
that at this stage the answer was general enough that



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

Mr. Dabbs could answer in more general terms and --  
Can you -- ?

WITNESS DABBS: A Yes, my  
understanding from reading the literature is that  
there is an increase in the depth of active layer,  
due to an increase of heat energy absorbed.

MR. ANTHONY: Q What  
happens then to the organic mat, that has been satur-  
ated by this crude oil or fuel oil or whatever the  
case may be? Does it wash away? Does it obtain?

A No, I don't believe it  
washes away. Some of its insulative properties are  
probably reduced -- well, I'm sure they're reduced --  
and that also contributes to the increase in active  
layer but it's not washed away that I'm aware of and  
remains there to retard or prevent any erosion.

Q Now, if there should  
be a toxic chemical spill and I'll deal with the  
lubricants you propose to use at your compressor station  
sites or crude oil so that it should to go over part of  
the right-of-way which you have to re-vegetate, what  
do you do?

MR. MARSHALL: You are postu-  
lating a spill of some lubricant at a compressor station  
site that goes off the pad and on to the re-vegetative  
right-of-way?

MR. ANTHONY: I'm saying any  
toxic spill on any part that Mr. Dabbs has to re-  
vegetate.



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

1  
2 A Depending on the nature of  
3 the material and the extent of its effect. In other  
4 words, being about as wild as we can be in this  
5 projection of spill, it is not likely to cover a very  
6 large area but still if it were to happen, there may  
7 be reason to attempt to remove some of the soil if  
8 it happened to be right on the right-of-way as you  
9 mention it, but I don't think there would be any  
10 cause to.

11 Q Well, what do you do ?

12 A I'm having a hard time  
13 visualizing the situation ever happening on an area  
14 big enough to be --

15 Q Well, let's not worry  
16 about the size then because I think you would agree  
17 that a toxic spill at a very crucial drainage run  
18 or drainage pattern could have a substantial effect on  
19 erosion control measures whether it covers an area  
20 in square yards or an area in square miles.

21 MR. MARSHALL: Do I understand  
22 you correctly?

23 MR. ANTHONY: Pardon.

24 MR. MARSHALL: It would have an  
25 effect on erosion control measures?

26 MR. ANTHONY: Well, the re-  
27 vegetation program is part of the erosion control  
28 technique.

29 MR. MARSHALL: You are talking  
30 about a spill in the water.



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

MR. ANTHONY: Well, perhaps,  
Mr. Marshall --

MR. MARSHALL: I'm sorry. I  
am confused.

THE COMMISSIONER: I thought  
he was talking about a spill on the right-of-way and  
Mr. Dabbs said that the observed effect has been to  
increase the extent to which the active layer is  
thawed. That is, it increases the volume of the active  
layer or the depth of the active layer and so, I take  
it, that may well have an impact on drainage in, I  
suppose in a number of ways, but let's pursue this to  
the end if there is anything in it, Mr. Dabbs, do you  
have any comment on that?

WITNESS DABBS: A If  
such a situation would take place, I say, I have a  
hard time imagining how but if it were to take place  
on a slope leading to anywhere, but it's a situation  
where <sup>there</sup> / is some erosion problem. Physical erosion  
control methods are obviously going to have to be  
depended on to prevent erosion <sup>down</sup> / slope. This material  
is as toxic, as you say, if it gets on to the intact  
ground cover -- native ground cover -- it may result  
in the death of the plant material in it but would  
not result in the removal or loss of it so it's  
erosion resistance capabilities would not be affected  
so the worst situation then that -- in such an area --  
would be, spill on the exposed backfill crown we are  
charged with re-vegetating.



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

1  
2  
3 And if the nature of  
4 this toxic material is such that it is not going to  
5 break down. Its toxic influence is going to remain  
6 for some considerable period of time, it, I believe  
7 we would have to consider the removal of some of that  
8 material and the replacement with other selected back-  
9 fill or simply covering it with an additional crown,  
10 an addition of backfill from a borrow site and reseeding  
11 on to that.

12 Q So that the end point  
13 that I'm concerned about is that when you have such  
14 a toxic spill, you are not going to be able to re-  
15 vegetate over it. You're going to have to replace  
16 that soil with more suitable soil for your re-vegetation  
17 program?  
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Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1                                   A     Sir, if the toxic material  
2     as I said in itself does not break down but persists as  
3     a toxic material for a number of years, or is likely  
4     to persist as a toxic material, <sup>1</sup>If it isn't, if it's  
5     toxic, it can be very toxic in its first application  
6     but by <sup>bio</sup>degradation and other means of breakdown it  
7     loses its toxic properties within a year or two, then  
8     the physical erosion control techniques implemented  
9     by engineering, we would simply count on those to pro-  
10    vide the erosion control required and wait a year or  
11    two for the breakdown of that toxic material, and in  
12    so doing there would be no need then for the replace-  
13    ment of backfill or removal of it, or covering it up.

14                               Q     If you weren't going to  
15    remove the material would you have to use any other  
16    technique to protect the soil in that area until the  
17    natural process has removed the toxicity so ~~that~~ your  
18    revegetation program can proceed.

19                               A     I think the physical  
20    erosion control techniques proposed will be more than  
21    adequate to control erosion, and if for some very  
22    strange reason that wasn't adequate, then a simple  
23    mat material, surface mat could be applied to hold  
24    the surface soils from eroding and await the breakdown  
25    of the toxic material.

26                               Q     Turn then to the question  
27    of the seed mix that you propose to use, and I believe  
28    that you had indicated to, in Appendix "C" in your  
29    direct evidence before this Inquiry that it's to vary  
30    according to the soil and drainage conditions in the



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
CrossExam by Anthony

1 particular locality.

2 THE COMMISSIONER: Excuse me.

3 How much longer do you think you will be, Mr. Anthony?

4 MR. ANTHONY: I think another  
5 15-20 minutes.

6 THE COMMISSIONER: Well, we'll  
7 adjourn for coffee.

8 (PROCEEDINGS ADJOURNED FOR FEW MINUTES)  
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Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

(PROCEEDING RESUMED PURSUANT TO ADJOURNMENT)

MR. GOUDGE: I wonder if we  
might return to questioning?

THE COMMISSIONER: Yes.

MR. ANTHONY: Mr. Dabbs, I  
would like to turn next to the re-vegetation program  
itself and the seed mix and I note in Appendix C, that  
you have indicated and through your evidence have  
indicated that the seed mix itself will vary depending  
on soil and drainage condition in a particular loca-  
lity and that therefore the seed mix together, will vary  
from area to area depending on the condition that you  
find at that location.

And I believe also that you  
indicated in your earlier evidence that you will ac-  
complish this selective seeding by the use of heli-  
copter seeding to ensure that the seeds falls in a  
particular locality rather than in the fixed-wing,  
which would be broader sweep for a larger area. Is that  
in fact what you intend?

A I think it would be good  
at this point to clarify in fact, that there a number  
of options open for the application of the seed and in  
Appendix C to the phase two testimony, we even indicate  
that our preference now would be to a winter seeding  
from a large truck with 'hoppers and seed on board,  
at least a large bulk of the seeding and <sup>then</sup> dressing the  
right-of-way with the spring seeding through aerial  
application.



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

And this can be achieved by the fixed-wing aircraft or a helicopter and the selection of either type of aircraft really depend on the location. For instance, the perfectly adequate seeding program can be achieved with a fixed-wing aircraft if there is many miles of relatively level terrain, about the same seed mix and there are many areas where we could go on for many miles with the same seed mix.

The fixed-wing aircraft can apply that seed to those areas and achieve a very successful re-vegetation. Where you would want to go with the use of helicopter would be where erosion potential is higher and consequently it is more important that you place the seed specifically in the areas of concern.

I think I mentioned, when asked by commission counsel to describe the seeding program of the Copenilly Hill on the Pointed Mountain line , I think that is a good example of where/<sup>a</sup>helicopter should be used for the slopes and hillsides because you have to proceed so much slower and be very careful in the placement of the seed.

But a fixed-wing aircraft can place the seed on a straight-way portion of the right-of-way where your not varying the seed mix and achieve the same goals.

Q I understand that as being the situation and I gather from what you have said that the use of helicopter, or you would expect to use heli-



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2       copter in those situations where you have to seed areas  
3       where there is a water course, the valleys and the  
4       approach to the water course itself; this would be  
5       the type of place where you would have to have some  
6       selective seeding because obviously there is a different  
7       situation there than along the major right-of-way.

8                   A   Yes, wherever there is a  
9       reason for selective seeding, either in the case of  
10      sloping terrain which is a high erosion potential,  
11      or where you would desire a quick change in seed mixes  
12      for rapidly changing conditions.

13                   Q   Would you anticipate that  
14      you would be using helicopter seeding on portions of  
15      the route across the North Slope along the prime  
16      route?

17                   A   I would anticipate, for  
18      the types of areas that were just described, that the  
19      helicopter would be used.

20                   Q   In fact, using the criteria  
21      you have provided you will likely have to use helicopter  
22      seeding throughout the whole length of your route?

23                   A   At places throughout the  
24      whole route, yes.

25                   Q   Now, when you have-- How  
26      do you accomplish the seeding itself with the helicopter  
27      when you have your particular seed mix which is designed  
28      for areas along a water course? Do you fly to a par-  
29      ticular water course and seed and then carry on to the  
30      next water course and seed it and so on?



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 A The bucket that was shown  
3 in one slide, the sling bucket beneath the heli-  
4 copter carries, as I recall, I would have to check, but  
5 something in the order of a couple hundred pounds of  
6 seed and that amount of seed generally will only do  
7 perhaps the length of a right-of-way which would cross  
8 a stream or cross a ravine or something like that and  
9 you would have to return to a logistics point to have  
10 it refilled.

11 Q And what do you intend,  
12 where do you intend to locate these logist points? Are  
13 they going to be at the compressor station sites or are  
14 you going to have intermediate staging areas where the  
15 seed will be located and available?

16 A I would foresee and of  
17 course these are plans to be evolved as things are  
18 finalized, but I would foresee that, of course the  
19 compressor sites themselves would become a major points  
20 for stockpiling seed and fertilizer and with the spacing  
21 of roughly fifty miles between them, the maximum distance  
22 you would go out from each one of those would be twenty-  
23 five miles.

24 Now that gets to be quite a  
25 fairly long haul with the helicopter. I would think that  
26 the seed and fertilizer required to treat particular  
27 crossings or ravines or so forth, could be stockpiled in  
28 waterproof bags on palettes in the wintertime at those  
29 particular spots and use them in the spring. So there  
30 could be a series of minor storage areas for seed.



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 Q So, for the seeding program  
3 you would have helicopters taking off from the compressor  
4 sites to the particular location, seeding and going back  
5 to the compressor site or to one of these intermediate  
6 sites?

7 A Yes.

8 Q And have you any guidelines  
9 or recommendations as to the locations of these inter-  
10 mediate sites?

11 A It would only be considered  
12 if there was a stretch of several miles, both sides of  
13 a valley or something like this where we are going to  
14 have to treat it with some particular care, that would  
15 be perhaps more than fifteen miles from<sup>a</sup> compressor site  
16 just to cut down on the ferry time back and forth.

17 And in terms of guidelines on  
18 storage it would be one of just keeping the seed and  
19 fertilizer dry and in a location where if there was an  
20 accident or a bag of fertilizer got ripped open, it  
21 wouldn't be washed into a stream or water course.

22 Q You see my concern when you  
23 have, of course, just a bucket of seed that will do one  
24 particular river-crossing, is that you will require in  
25 some instances a number of ferrying trips back and forth  
26 with a helicopter if you are going to seed each particular  
27 water course one at a time.

28 A Oh, yes. I am quite aware  
29 of that.

30 Q And I imagine that you would



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 recommend that Dr. Gunn and Mr. Jakimchuk and others  
3 would have some say on what intermediate landing sites  
4 you propose for your helicopters?

5 A Yes, we have carried on this  
6 dialogue for some time.



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 Q So in other words there  
2 will be the takeoff and flight of helicopters at  
3 intermediate locations at various portions along the  
4 route.

5 A Yes.

6 Q Could you tell me from  
7 what height you are able to seed, using this bucket  
8 technique?

9 A The height of the heli-  
10 copter isn't that important, depending on the length  
11 of cable and so on and so forth that you have underneath  
12 there would be a figure, I think I used when formally  
13 introducing these slides, was the helicopter was  
14 approximately 100 feet, and the bucket ~~was~~ hanging  
15 below that; but I think if you want to know what  
16 height the bucket should be at, I would say 40 to 50  
17 feet above ground and then the helicopter can be  
18 whatever height above that, depending on the length of  
19 cable and so on and so forth.

20 Q So from your perspective  
21 of actually implementing this revegetation program,  
22 the height of the helicopter above-ground doesn't  
23 matter. You just add extra length to the cable.

24 A Yes, to within just some  
25 reasonable degree, of course. You couldn't add 100  
26 feet of cable because you'd have something swinging  
27 loose beneath the helicopter, you'd have no control of.

28 Q But you expect your  
29 revegetation program would require helicopters at  
30 these locations to fly within what minimum/maximum height



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 in order to accomplish what you have to accomplish?

2 A Well, I think you sit  
3 pretty much at 40-50 feet above ground for the bucket  
4 itself, to be effective in its placement of the seed.  
5 We've certainly found that through all the experience  
6 we've had in seeding from helicopters, and you are  
7 restricted to that height in your actual -- at the  
8 time of application. You're not restricted to that  
9 height on your return trip at all.

10 Q I'm dealing now with  
11 the time of seeding, so do I understand that you're  
12 concerned about this swinging cable, do you mean that  
13 the cable would be restricted to approximately 50 feet  
14 and the bucket would have to be approximately 50 feet  
15 above the ground?

16 MR. MARSHALL: All this witness  
17 can say is that he's got to have the bucket 40 to 50  
18 feet. Now surely it's a matter for the helicopter  
19 pilot or the authorities that control the use of these  
20 machines to determine how much cable you can have  
21 hanging down. I don't think Mr. Dabbs as a botanist  
22 can be of much assistance, sir.

23 MR. ANTHONY: Well, I had  
24 assumed that Mr. Dabbs had some experience with a  
25 revegetation program and could give some indication  
26 as to how his revegetation is actually going to be  
27 carried out, so that when we get to discussions with  
28 Dr. Gunn and with others we have an indication of  
29 the varying techniques that have to be used and the  
30 heights that have to be used at the various water



Banfield, Dabbs, Dunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 crossings and so on.

2 MR. MARSHALL: I think there  
3 was adequate description of this the week that Mr.  
4 Anthony wasn't with us. There was a slide shown of  
5 this technique in operation, and what more can you say?

6 MR. ANTHONY: Well, I've  
7 looked through the transcript. I obviously didn't  
8 have the slides to assist me, but I gather that there  
9 was some difference of opinion in the evidence led  
10 between Arctic Gas and Foothills about the height that  
11 seeding has to take place. I thought with Mr. Dabbs  
12 here you would be in a position to indicate what -- how  
13 this technique actually works in practice. Now, if he's  
14 unable, then he's unable, but I thought that he was  
15 getting to that point and I thought it was an important  
16 point to make.

17 MR. MARSHALL: My recollection  
18 was that Mr. Dabbs has indicated the helicopter was  
19 flying at about 100 feet with a bucket suspended  
20 beneath it, and someone mis understood and thought  
21 that the speed was -- that the seed was being spread  
22 from a height of 100 feet, and there was confusion in  
23 the mind of the person.

24 A That was the only con-  
25 fusion, sir, I believe, there is considerable experience  
26 both ourselves, in the south, with right-of-way seeding  
27 and an elevation above-ground of about 40 to 50 feet  
28 gives an excellent seed spread, and it's a safe  
29 altitude, as safe as a helicopter can be.

30 THE COMMISSIONER: Well, the



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 tests that you people described yesterday, as I  
2 recall, indicated that helicopters caused greater  
3 disturbance to birds than fixed wing aircraft did. I  
4 think that was the result of the tests you carried out.  
5 Well, we know that so far as you can ever pin these  
6 things down, to carry out the reseeding program  
7 helicopters would have to travel at something like  
8 100 feet above the right-of-way. I don't really think  
9 it matters very much whether it's a few feet less or  
10 a few feet more than that. The number of passes  
11 they would have to make would be very difficult to  
12 determine now; what is vital is the time of year when  
13 they're going to be making those passes and the re-  
14 lationship between that time of year and the time  
15 when the birds are using the area for staging and  
16 for nesting, and it seems to me that's all there is  
17 to this. They have got a front lawn that runs from  
18 Prudhoe Bay to New York and Chicago, 120 feet wide,  
19 and they don't know how to keep the birds off it.  
20 They've conceded that. Now --

21 MR. MARSHALL: I think they  
22 know how to keep the birds off it, sir.

23 THE COMMISSIONER: Well, they're  
24 not worried about the birds de-vegetating it, if  
25 there is such an expression.

26 MR. MARSHALL: I suppose one  
27 could keep the birds off but the techniques might be  
28 totally unacceptable.

29 THE COMMISSIONER: I think they  
30 probably would be. At any rate, that's about where



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 we're at, isn't it? Can we get much more change  
2 out of these people on this issue?

3 MR. ANTHONY: Well, the only  
4 other issue that I wanted to direct Mr. Dabbs on, is  
5 that I understood from Dr. Vaartnou that you couldn't  
6 reseed, or if you did reseed you'd be seeding over too  
7 broad an area if you tried to fly at the height that  
8 Mr. Dabbs is suggesting you do, and that in fact -  
9 the reseeded will have to be done at a much lower height.  
10 I just wanted to get his comment. Now, we've had two  
11 different indications, and the reason I think it's  
12 important is for the very reason you've suggested,  
13 when we get into the birds and caribou section it  
14 may be significant as to whether or not they have to  
15 fly at 50 feet or 200 feet, which seems to be the  
16 limits that we're talking about now. I believe Dr.  
17 Vaartnou suggested to disperse seeds in the way sugges-  
18 ted would have to require much lower flights, and I  
19 have in my mind something in terms of 50 feet, and  
20 --

21 MR. MARSHALL: Well, that's  
22 what Mr. Dabbs said, 40 to 50 feet for the bucket.  
23 That's what Dr. Vaartnou said, and as I mentioned,  
24 there was confusion in the minds of somebody asking a  
25 question who took the height that the helicopter was  
26 flying as being the height from which the seeds would  
27 be dispersed.

28 THE COMMISSIONER: By the  
29 way, nobody measured the height that the helicopter  
30 was at. It was an estimate looking at the slide.



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 There wasn't anything very scientific about it.

2 MR. ANTHOBY: I think we've  
3 now got Mr. Dabbs' indication of what he thinks the  
4 actual height of the helicopter is going to be, and  
5 that, I think, may be of some significance when we get  
6 into the birds and caribou section of this panel.

7 A I think just for  
8 clarification here Mr. Marshall has identified it.  
9 There is this confusion as to what that number meant  
10 and I have read the transcripts of Dr. Vaartnou's  
11 presence here and I completely agree with him, if we  
12 were seeding with the bucket at an elevation of an  
13 altitude of 100 feet, yes, it would be spread out much  
14 too far and it has to be at about 40 or 50 feet, and  
15 our own experience and the experience of many people  
16 confirm that.

17 Q Now, you've given in  
18 your evidence an indication of the -- when you're  
19 reseeding on the North Slope, when you intend to commence  
20 your reseeding on the North Slope following June 20th,  
21 can you tell me how long you would anticipate the  
22 reseeding program to take in that area?

23 MR. MARSHALL: I don't think  
24 that was the evidence. The evidence was that they intend  
25 to reseed immediately following the pipeline operations.

26 A I will try and clarify this  
27 again. In my evidence, as I recall, I suggested that  
28 the ground seeding in wintertime following backfilling  
29 will apply most of the seed and fertilizer. We  
30 accept the fact if, for various reasons that we could



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 identify, that there will be a need for a spring,  
2 light seeding in the spring, a dressing seeding, and that  
3 seeding on the North Slope particularly, your date  
4 was correct, following June 20th in order to avoid  
5 conflict with calving caribou.

6 MR. ANTHONY: Just so Mr.  
7 Marshall has that information, he seems to be concerned  
8 that I have misinterpreted the evidence, I refer you  
9 to --

10 MR. MARSHALL: There are two  
11 aspects to it, Mr. Anthony. You were suggesting that  
12 they were going to carry out their seeding at that  
13 particular time, and Mr. Dabbs made it clear in his  
14 evidence that the bulk of the seeding was going to be  
15 done as part of the construction activity, and it was  
16 only going to be in those areas that required further  
17 dressing that they would be back in a period in the  
18 summer.

19 MR. ANTHONY: Well, Mr.  
20 Commissioner, I'm dealing now with the question of  
21 helicopter seeding, and the phrase that I got to  
22 select that date was a statement in the evidence at  
23 page 14 and 15, and I'll read that. It says:

24 "Helicopter seeding of areas in the North Slope  
25 would not commence before June 20th, which places  
26 it a week or more after the last known date  
27 of calving of the Porcupine caribou herd,  
28 thus avoiding any direct conflict between  
29 aircraft activity and cows at the time of  
30 calving."



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 The question I put to you is that you've now given us  
2 the starting date of your helicopter seeding on the  
3 North Slope, have you not?

4 A I have, and I believe  
5 in a previous panel we discussed the time frame which  
6 would be approximately until the end of the first  
7 week in July.

8 Q What about along the  
9 Mackenzie River itself, have you broken down the  
10 areas <sup>and</sup> / indicated starting times and duration in that  
11 portion of the route?

12 A No, we haven't broken  
13 it down in that regard. There is, of course, no  
14 problem with barren ground caribou so there's no  
15 conflict in that regard. There is a potential  
16 obviously for some conflict with migrating birds, but  
17 as Dr. Gunn identified in his testimony, they stick  
18 largely to the rivers in the spring movement north  
19 because the lakes inland are still largely frozen and  
20 the right-of-way is sufficiently far from the river  
21 that, to this point in time they have not drawn my  
22 attention to any serious problems with starting seeding  
23 as early as the spring will allow, and I think that  
24 would be our only criteria at this point, that we  
25 would seed as early as that particular season would  
26 allow in order to maximize the use of moisture and  
27 snow melt.  
28  
29  
30



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

Q The usual question on the reseeding program in the valley is solely a question of when the terrain is ready to receive the seed and not because of any other considerations such as birds or any other animals?

A I think there could be others and Dr. Gunn is the one to perhaps specify them. I myself can foresee that in areas he has also identified some areas in the valley that are important in the spring such as the lake complexes north and south of Norman Wells where we would want to proceed with caution in our seeding in the spring.

Again we're speaking of flying at an elevation of 50 to 100 feet to apply seed over the half mile or so with the seed bucket and then we can climb to a higher elevation on the return. There's only the portion that is actually being seeded that we have to be at that elevation. We don't have to fly at a hundred feet three or four times for the full say twenty miles out from a compressor station site.

Q Dealing now still with the question of timing, perhaps while Mr. Dabbs is here, Dr. Gunn, you could indicate whether you have any limitation you want to put on the time when reseeding can start within the Mackenzie Valley as much as Mr. Jakimchuk or Dr. Banfield have suggested on the North Slope?

WITNESS GUNN: A If there



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

1  
2 any difficulties from : birds in regards to the  
3 seeding program beginning as soon as possible, I think  
4 they might arise from seed-eating birds, finches  
5 arriving quite early in the spring but they don't tend  
6 to be in diffuse, in concentrated flocks at that time.  
7 They are breaking up and beginning to nest almost as  
8 soon as they get in the area .

9 Where waterfowl, I think  
10 that the waterfowl at that time will stick pretty  
11 closely to the water and they are not likely to go  
12 wandering off to the right-of-way looking for seeds  
13 or grain.

14 I anticipate that there  
15 will be some loss of seeds but I don't think it will  
16 be of major proportions.

17 Q And as far as the  
18 question again just of timing, you have got no  
19 recommendations to make as to the earliest day for  
20 timing from the protection of bird point of view?

21 A Well, I think that on  
22 the North Slope, the timing of June 20 is very con-  
23 venient to us because the seed-eating birds arrive  
24 back the end of May but they switch their diet largely  
25 to insects as soon as the insects become available.  
26 And this will occur by about June 20 so that when they  
27 first arrive, seeds from the previous year are really  
28 the only source of food available but then they  
29 diversify from that as soon as the insect life becomes  
30 apparent. So, if by June 20, the need for seed food



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

1  
2 is much less than if the program had started say on  
3 June 1. In the boreal forest, on the tundra, there  
4 is more opportunity for them to concentrate and there  
5 are more seed-eating birds. In the boreal forest, we  
6 have more insect-eating birds and less likelihood for  
7 them to concentrate on the right-of-way.

8 Q Do I gather then that  
9 you are happy with the time frame on the North Slope  
10 and you have got no other time frame that you want  
11 to impose within the valley?

12 A That is right. If some  
13 strong difficulty should arise on the Mackenzie Valley,  
14 we could look at it but I don't anticipate that it  
15 will at the present time.

16 Q Thank you. Mr. Dabbs,  
17 I understand that the mix that you have proposed to  
18 use will contain commercial fertilizer. Have you been  
19 able to assess the amount that would be required on  
20 your North Slope seeding program or --

21 WITNESS DABBS: A I  
22 believe in Appendix "C", we do have a statement of  
23 current anticipated rate and formulation for the use  
24 throughout the route and in so doing, we have assessed  
25 what it will be and it's a straightforward calculation  
26 in terms of quantity.

27 Q Now, in some work that  
28 Dr. McCart had done about the -- he expressed some  
29 concern in Volume 15 of the Biological Report Series  
30 about the short-term increase in nutrient loading in



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

1  
2 a stream. Have you coordinated your reseeding  
3 requirements for fertilizer with<sup>the</sup> sort of concerns that  
4 Dr. McCart has expressed?

5 A We have discussed this  
6 several times. I think Dr. McCart could perhaps  
7 comment on any concern he may have at this point in  
8 time regarding the short-term nutrient loading.

9 WITNESS McCART: A We  
10 discussed this, I think, a week or so ago and my  
11 feeling is that the amount that is likely to get into  
12 a stream as a result of seeding is insignificant in  
13 terms of the total nutrient loading of these streams  
14 and I am not concerned about this at all.

15 Q So the program as devised  
16 by Mr. Dabbs is satisfactory from your perspective as  
17 far as the nutrient loading is concerned?

18 A Yes.

19 Q Mr. Dabbs, I note in your  
20 list of studies that you have done or the studies that  
21 you propose to do that you have not undertaken any  
22 studies of the impact on the terrain of any large  
23 oil spills, for example. Now, this point was raised,  
24 Mr. Commissioner, by you yesterday and I'm wondering  
25 whether either Mr. Dabbs or counsel can indicate whether  
26 the panel is going to make any statement to this  
27 Inquiry on it or whether they wish us in our questioning  
28 now to proceed with these questions. I'm prepared to  
29 defer any cross-examination as far as the impact of  
30 oil or an oil pipeline on the terrain within the



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

Mackenzie Valley or the river system or whatever the case may be if my friend indicates that there is going to be further evidence lead on the point --

THE COMMISSIONER: I think that it wouldn't be fair to cross-examine the impact of an oil pipeline at this stage. Mr. Genest and Mr. Marshall on behalf of Arctic Gas and Mr. Gibbs and Mr. Hollingworth on behalf of Foothills have indicated that they will bring forward evidence in due course relating to the impact of an oil pipeline as the pipeline guidelines laid down by the federal government require them to do.

I was simply asking these gentlemen if they wished sometime this week to comment on the larger impact that an energy corridor would have, that is, the additional components of an energy corridor would have if the gas pipeline went ahead and I didn't want at this stage to open the whole question of an oil pipeline up.

We'll have to look at that. We can't look at it in the same detail as we're looking at the gas pipeline but we are bound under the guidelines to look at it and it would be, I think, wrong not to look at it but I don't want you to go into that now. You can go into the whole question of fuel oil spills because of course, they need vast quantities of fuel oil to build this, to construct this gas pipeline, but not into the spills that might occur if an oil pipeline were built.



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

MR. MARSHALL: Mr. Commissioner,  
with respect to the issue that you had raised and that  
is the possible cumulative impacts of additional  
facilities within a broad corridor, the members of  
the panel, I think, are prepared to make some comment  
on that now.

It may be that these  
matters will be gone into in more detail, subject to  
some arrangements being made with Commission Counsel  
or by various participants, Mr. Gibbs and myself, about  
timing but Mr. Hemstock and I think the others could  
make some comments in response to your request if  
you wish.

THE COMMISSIONER: Yes, I think  
they should do that and do it now if they wish.

MR. MARSHALL: Fine. Mr.  
Hemstock, would you wish to comment about --

THE COMMISSIONER: Just before  
you do, Mr. Hemstock, I -- the pipeline guidelines  
were issued back in 1972, I believe, and from 1972 to  
this day they have made it plain that any company  
that wants to build a gas pipeline has to submit  
evidence not only relating to the impact of the gas  
pipeline would have but relating to the impact an oil  
pipeline would have too. That makes sense because the  
oil companies that are part of your consortium are  
also part of the consortium that now says it wants to  
build an oil pipeline by 1983.

The two companies, Arctic



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

Gas and Foothills will be required to bring forward that evidence because they have been on notice since 1972, it would be required. And none was filed by Arctic Gas in March last year when they filed their application for a right-of-way and none was filed by Foothills in June this year when they filed their application but it will be required.

And, Mr. Scott and counsel out will have to work the ways and means of doing this and the time that we can hear it because one of the problems we have here is that we have just been listening this morning to this discussion of the 120-foot right-of-way and yet this project isn't just a 120-foot right-of-way. It involves construction spreads, compressor stations, 98 sites for gravel mining and borrow operations, the doubling of tug and barge activity on the river, 6,000 men, 250 river and stream crossings, access roads and of course, many, many flights by fixed-wing aircraft and helicopters. And then of course, if it is built, it is likely that it will be followed by an oil pipeline so it's a big job.

Well, you gentlemen go ahead now and offer whatever comments you wish and bearing in mind that we're not going to pin you to the wall on these things because I only raised them on Monday.

WITNESS HEMSTOCK: A I  
have not, certainly have not prepared any formal



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Anthony

1  
2 remarks and I would like to just if we could take  
3 a look at the pipeline guidelines and perhaps go  
4 through them and make comments on certain parts of  
5 them.  
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Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

pretty  
Again, we have taken a /informal  
approach to it, but on page 9 of the guidelines that we  
are referring to and item/2 on that page is to convine  
the environmental disturbance arising from pipelines and  
their construction to a limited area--"

Q It was at page what?

A Page nine.

Q Yes.

A Paragraph two on that page,  
paragraph marked number two on that page. --to a limited  
area trunk and oil and gas pipelines within the corridors  
outlined in the above, are to follow routes that as close together  
as is consistent with the differing engineering constraints.

And I think perhaps it's just with the amount of effort that has gone on in these hearing so far and there are many references to Alyeska these engineering constraints are now pretty well outlined.

The gas pipeline, of course, is a cold pipeline. The oil pipeline is, apparently has to be a hot line.

Q It would have to be a hot line and presumably elevated if one were built in the Mackenzie Valley?

A I personally can't go that far. I think that it could well be on a berm construction simply in the same manner as the test site was built at Inuvik and I think it's a matter of very careful study of the thermodynamics of that with regard to maintaining



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 a perma frost in frozen condition so that it may be a  
3 berm line or a line on piles.

4 But that perhaps is the first  
5 area which has to be looked at, and the point is that  
6 there is a very differing sensitivity as far as the  
7 terrain is concerned for the two lines and much of what  
8 would be classified as sensitive terrain for a hot oil  
9 pipeline, is not a sensitive terrain to a cold pipeline.

10 So, that there will be en-  
11 gineering requirements for different types of terrain  
12 with these two different kinds of pipelines and there  
13 will therefore, in some cases, be reasons that they  
14 should diverge to another, that the oil pipeline might  
15 diverge to another terrain.

16 I think this still is consistent  
17 though with the corridor concept, that you select the  
18 type of terrain that best suits your pipeline within the  
19 broad corridor of the Mackenzie Valley.

20 And they go on to say that they  
21 should be as close together as to bring about, not so  
22 close together as to bring about undesirable environmental  
23 interaction and I think we take as the cynogistic effect,  
24 that Dr. Banfield has discussed and Dr. Gunn has given  
25 us an indication about in say the disturbance to birds,  
26 that is the repeated flights.

27 Now, at this stage we don't have  
28 too much to go on with regard to the design of the  
29 pipeline. All we have is the preliminary assessment  
30 which was provided by the Mackenzie Valley Pipeline



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 Assessment Group and I don't have the report but as  
3 I recall they concluded that it was feasible to build  
4 a pipeline and they did provide a tentative alignment  
5 on the Mackenzie Valley corridor and this was based on  
6 a fair bit of research plus the operation of the hot  
7 oil test site at Inuvik.

8 But in looking at that alignment  
9 and comparing it with the alignment that is proposed by  
10 Arctic Gas, we really don't see any conflicts in the  
11 selection of the alignment. There is only a very few  
12 narrow places in the Mackenzie Valley from the delta to,  
13 as a matter of fact from the delta right all the way  
14 through. There is a couple that come to mind. There is  
15 Gibson Gap in the Chick Lake area and perhaps the fairly  
16 critical area at the crossing of the Great Bear.

17 But again, we, at least in the  
18 preliminary assessment of what Mackenzie Valley have  
19 produced, we don't see any great difficulty in finding  
20 lots of space, with the differing requirements, to have  
21 the two lines parallel.

22 I don't think that we could be  
23 much more specific until the new group, the Beaufort  
24 Delta Group have provided more study and the pipeline  
25 alignment.

26 I think perhaps the real ad-  
27 vantage to this corridor concept is that the, if  
28 the two lines are parallel and within a general corridor  
29 there is a pretty good chance, in fact, we should all  
30 strive to, as much as possible, use the same airstrips,



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 the same dock and wharf facilities, probably reinforce  
3 or provide backup in terms of communication facilities.  
4 It would seem also likely that the oil pipeline people  
5 would use one and perhaps all of the three major fields  
6 areas that we have suggested at Inuvik, Norman Wells  
7 and Simpson and then therefore confine their impact  
8 to communities to those three particular communities.

9 Then the guidelines go on to  
10 say, "The same principle is also to <sup>apply</sup> where the  
11 <sup>pipeline</sup> trunk / routes lies parallel and near to a present  
12 or proposed highway, or other overland communi-  
13 cation systems". And it goes on to say that, "In view  
14 of the influence of the first trunk pipeline in shaping  
15 the transportation corridor system and in molding the  
16 environmental and social future of the region, any  
17 applicant to build the first trunk pipeline, within any  
18 segment of the corridor system outlined, must provide",  
19 and then they go on and talk about the, "Assessment  
20 of the suitability of applicant's route for nearby  
21 routing of the other pipeline", and I have just commented  
22 on that that I see no difficulty in that area but I  
23 would have to disagree with the approach that is taken  
24 here in the guidelines themselves; in saying, "That the  
25 first trunk pipeline shapes the transportation corridor".

26 I disagree with this entirely.  
27 The corridor is already shaped. It was there when people  
28 first started to move down the Mackenzie and selected  
29 their villages and settlements along there. It was  
30 reinforced in the early forties when the Canol Project



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 built the first winter roads in as far as Norman Wells  
3 and from Norman Wells on further north.

4 It was again reinforced when the  
5 government installed the land communications system  
6 right to Inuvik and on down to Tuk. The corridor con-  
7 cept was reinforced again when the government licensed  
8 to industry the building and the maintenance of a winter  
9 road along the Mackenzie and again all of the way to  
10 the north.

11 So that it seems to me that  
12 the corridor has already been selected and that there  
13 is already many facilities in it and then finally, of  
14 course the government has announced that they are going  
15 to build a highway down to the Mackenzie Delta. And  
16 furthermore, the highway is constructed in several  
17 sections, both to the south and to the north and the  
18 clearings have been made for the highway in the future  
19 but the clearings are already there so that alignment  
20 has been selected.

21 I don't know how far it has  
22 gone. I know that it has gone past the Donnelly River,  
23 well north of Norman Wells.

24 Q The clearing?

25 A The clearing has, yes, so  
26 that the alignment or the corridor, if you like, has  
27 been selected for all of those communication systems.

28 Q Well, mother nature chose  
29 the corridor?

30 A Right.



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 Q The Federal Government came  
3 along after that?

4 A Yes, but by several activities  
5 they have reinforced this and in fact, have selected the  
6 corridor. So, the first trunk pipeline comes through  
7 what is already a selected corridor and we have looked  
8 at it in that way.

9 We find no great difficulty  
10 in selecting an alignment which is parallel to the  
11 communications system and the road system and obviously  
12 to the Mackenzie River too, which is the barge system  
13 which supports the supply of materials to the pipeline,  
14 proposed pipeline construction.

15 So, I think all of that has  
16 already been done and we now have to look then at the  
17 location of the proposed gas pipeline within this  
18 corridor.

19 Again, as I suggest we have not  
20 had any difficulty in selecting a route which appears  
21 appropriate to the location of the communication line  
22 or the highway, nor do we see any difficulty in selecting  
23 a route which is consistent with the, at least the  
24 preliminary proposal for an oil pipeline as proposed by  
25 the Mackenzie Valley group.

26 And there is no reason that  
27 we can see that the Beaufort Delta Group, couldn't and  
28 won't be able to select a route very much like the  
29 Mackenzie Valley but with more, of course, much better  
30 definition.



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 It seems to me then that we  
3 have really, with that kind of approach, that we have  
4 followed what is required in the pipeline guidelines.

5 Q Well, if you look at the  
6 bottom of page 10 it says, just to paraphrase it, that  
7 "Any applicant who builds a gas pipeline must provide  
8 with his application an assessment of the environmental  
9 social impact of both pipelines", that is gas and oil  
10 on nearby settlements or nearby existing or proposed  
11 transportation systems.

12 I didn't write the pipeline  
13 guidelines. They were layed down by Mr. Cretien in  
14 the House of Commons on June 28, 1972. Arctic Gas  
15 had almost two years to prepare its assessment of the  
16 environmental and social impact of the gas and oil  
17 pipelines on nearby settlements and transportation  
18 systems. Foothills had more than three years and neither  
19 one has filed any material relating to the impact of  
20 both pipelines.

21 Each has sought to confine  
22 itself to the impact of a gas pipeline. That I can  
23 understand why they want to do that. They have done  
24 a lot of work, necessary work that the Federal Government  
25 told them they had to do, but they haven't given this  
26 Inquiry their assessment of the environmental and social  
27 impact of the oil pipeline in combination with the gas  
28 pipeline on nearby settlements and transportation  
29 systems.

30 That's a big job but we are



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 going to have to get around to it sometime during this  
3 inquiry. And you gentlemen who are concerned about the  
4 environmental impact, I asked you just to give me in  
5 a very broad way your views on the impact that an oil  
6 pipeline being built, after the gas pipeline, would have  
7 on mammals, birds, fish and so on because my job under  
8 the Order-in- Council, is to look at what you people  
9 say about these things and then report to the government  
10 what the impact will be on the gas pipeline and the  
11 oil pipeline as well if it is built.  
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Banfield, Dabbs, Gunn  
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1 And we won't be doing our job for the government and  
2 the north as well as Canadians as a whole if we don't  
3 do that. No one expects that you come forward with  
4 another 99 volumes or whatever it is that we've  
5 investigated so far; but we have to try to take a  
6 look at this and I'm not blaming you, Mr. Hemstock,  
7 I've raised this with the lawyers before and I'll  
8 no doubt be raising it again the way things are going.  
9 That's my concern. At any rate, you carry on with your  
10 remarks.

11 WITNESS HEMSTOCK: Well, as I  
12 read item 2, though, on that page 10, it says:

13 "Assessment of the environmental social impact,"  
14 and of course I'm speaking only about the environmental  
15 portion of it, both pipelines on nearby settlements or  
16 nearby existing or proposed transportation systems.  
17 It's the environmental impact on nearby settlements  
18 or nearby transportation systems.

19 THE COMMISSIONER: Are you  
20 saying that in the interrogative, or in a --

21 A It seems to me, or at  
22 least what I read into it is that they are asking if  
23 the impact of our pipeline would have a positive or  
24 negative or what kind of an impact it would have on  
25 the other transportation systems.

26 THE COMMISSIONER: Well, let  
27 me give an example of what I mean. We were told by  
28 the last panel that you people would require 30 million  
29 cubic yards of borrow material. We have been told  
30 somewhere along the line, I think the last panel told



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1 us that the oil pipeline would require 40 million  
2 cubic yards of borrow material. Now that seems to  
3 what might well be regarded as an environmental impact  
4 on nearby settlements or on nearby existing or  
5 proposed transportation systems. You may say that this  
6 isn't as clearly worded as it might have been but  
7 they were writing in 1972 and they hadn't the advantage  
8 of three years of study that has gone on since then.

9 A Well, that's perhaps  
10 a very good example, and obviously the oil pipeline  
11 will require supplies of gravel, but until the method  
12 of construction of the line is defined, I think it's  
13 very difficult to even -- in fact it's just speculation  
14 as to how much it might be, and so then the only approach  
15 you could take is the general approach that --

16 THE COMMISSIONER: I think  
17 that's what the Mackenzie Valley group thought they  
18 would need, the group that --

19 A The Mackenzie Valley group.

20 THE COMMISSIONER: Whatever you  
21 call it, yes.

22 A But -- and perhaps the  
23 new group has gone far enough to tell whether they are  
24 going to use berm construction or pile, but the method-  
25 ology has a lot to do with the amount.

26 THE COMMISSIONER: Certainly.

27 A So that really until that  
28 is defined, I think all that you can do is to take a  
29 look at the overall gravel supply and see if there is  
30 sufficient to take care of the two lines with ample



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1 quantities left over for all other requirements.

2 Now, I think that that has been  
3 reached. The difficulty is that there may well be a  
4 posity of gravel deposits in some areas, and long  
5 hauls will be required. But if you look at it on  
6 the overall basis, there is sufficient gravel there,  
7 it simply means that you have to go much further afield  
8 to get it in certain areas; but the details of how  
9 much and where of the specific impacts cannot be  
10 made at this time for the oil line until the specifics  
11 of that line have been decided. So we would have to  
12 approach it from a general standpoint.

13 THE COMMISSIONER: Yes, I  
14 know the way that you're approaching it, and I have a  
15 certain amount of sympathy with you; it's just that  
16 the Federal Government has laid down these guidelines  
17 and there they are. We all have to live with them and  
18 I think it's a far-sighted approach they've taken.  
19 They're saying, "We're not going to look at the gas  
20 pipeline in isolation. We want to look at the whole  
21 picture."

22 MR. MARSHALL: Mr. Commissioner,  
23 I think the members of the panel representing the  
24 various disciplines are prepared to respond to your  
25 request that they make a general statement at this  
26 time, and it may well be that we will have a session  
27 at the Inquiry where these things can be refined a  
28 little more precisely. Perhaps Dr. Gunn could begin  
29 by making some observations. I know he's certainly  
30 given consideration to this.



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1 THE COMMISSIONER: Yes, by all  
2 means, and I won't interrupt you gentlemen again. For-  
3 give me, and Mr. Hemstock, if you want to add anything,  
4 go right ahead.

5 WITNESS GUNN: Yes sir, I'll  
6 try to summarize my views on this in general terms.  
7 In terms of habitat loss to birds, I am not really  
8 concerned about a second or even a third pipeline or  
9 even a highway except in possibly a few critical places  
10 where the corridor might be constricted by topography  
11 and in areas such as that where there are areas sensi-  
12 tive to birds. I am more concerned about the numbers  
13 and distribution and activities of people involved in  
14 the construction and maintenance of such a pipeline.  
15 One of the important things that we like to think about  
16 is that if there are people working in these areas,  
17 that they should be confined largely within the work-  
18 ing area and not given the opportunity to move out in  
19 broad areas, or areas that are now relatively undis-  
20 turbed. So that in terms of a second pipeline I  
21 would be concerned about the numbers of people, where  
22 they are working, and under what regulations they come.

23 I would support Mr. Hemstock's  
24 suggestion that it would be highly desirable to use  
25 facilities that are being used by the first pipeline  
26 to be built, so that new areas and multiplication of  
27 such areas would be less. When I talk about the  
28 activities of people, I also consider them in the air  
29 as well as on the ground, the number of airplane flights  
30 and the restrictions involving these flights would be



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1 important to us.

2 I'd like to say something  
3 about the highway. To me this <sup>poses</sup> by far the greatest  
4 concern of all because it opens up the country to  
5 unrestricted travel and virtually uncontrolled travel,  
6 and when you put that condition close to areas that  
7 are particularly sensitive to birds, then I think  
8 that serious results might easily occur. I think,  
9 sir, that pretty well summarizes my views on the  
10 matter.

11 DIRECT EXAMINATION BY MR. MARSHALL (CONTINUED)  
12 Q Dr. McCart,  
do you have some observations?

13 WITNESS MCCART: Well, I  
14 commented, I think, in my direct evidence for this  
15 panel that we considered a gas pipeline as one  
16 level of potential detrimental effects on aquatic  
17 environments. An oil pipeline, might be five, and  
18 that a highway might be 10. Now it seems to me that  
19 we cannot in fact consider the effects, whether they  
20 be additive or explanancial, the effects of two pipelines  
21 in the area without also considering the highway which  
22 is far, far more damaging, and I would like to point  
23 out that there have been environmental studies  
24 conducted along that highway, but these are considered  
25 apparently, Dr. Banfield tells me, to be internal  
26 working documents, and they are not available to the  
27 public and they're not available to us. It seems to me  
28 that I couldn't sit down and discuss the oil pipeline's  
29 and its  
/potential impact along with a gas pipeline unless we  
30 are also in a position to assess that highway, which in



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1 my opinion, and in Dr. Wilimovsky's opinion, highways/  
2 roadways are likely to be far, far more damaging.

3 Q Mr. Jakimchuk, do you have  
4 any observations?

5 WITNESS JAKIMCHUK: Well, I  
6 will speak in very general terms once again. It's kind  
7 of a risky business because there are so many unknowns  
8 and intangibles, as Mr. Hemstock has pointed out.

9 I think we should, in consider-  
10 ing this, I would add comments regarding the highway  
11 to the other speakers, that that cannot be ignored.  
12 Its significance is very great with respect to mammals.  
13 More so, in my opinion, in a general sense than either  
14 an oil or gas pipeline. So much depends upon engineer-  
15 ing, I feel, and specifics of location for example,  
16 implications to mammals vary according to whether a  
17 buried mode, a bermed mode, or a raised mode of  
18 construction is utilized.

19 This cannot be assessed until  
20 we have some specific information. We can speak in  
21 terms of cumulative or additive effect. There is no  
22 question that an additional pipeline will create  
23 additional disturbances and have an additional impact.  
24 It's my general view right now, however, that these  
25 will be additive or incremental, in other words there  
26 will be another impact take place but it will not be  
27 a synergistic one. In other words, because of the  
28 second development that some great unforeseen hazard  
29 will occur, so that I would think that there will be  
30 additional impacts. Obviously there will be new



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1 rights-of-way, new requirements for material. In a  
2 general sense again I think that potentially -- and I  
3 use the word "potentially" because it all boils down  
4 to the engineering, the mode and the quality of the  
5 development. Potentially, however, there are more  
6 serious ramifications with respect to mammals from an  
7 oil pipeline than from a buried chilled gas pipeline  
8 because of possible above-ground structures, because  
9 of, I feel the significance of possible spills is  
10 greater from an oil line than rupture of a gas line.

11 If you want my general opinion  
12 sir, about those things that are really important in the  
13 Mackenzie Valley, I would have to say that environ-  
14 mentally the highway and any railroad are far more  
15 serious over the long-term than a pipeline. That's  
16 about all I can say at this point.

17 Q Dr. McCart, you didn't  
18 mention a railroad. Mr. Jakimchuk has commented on it.  
19 I wonder if you have any observations on that?

20 WITNESS Mc CART: Well,  
21 railroads, I find, are probably comparable or even  
22 possibly more damaging or potentially more damaging,  
23 to use that phrase again as a matter that Dr. Jakimchuk  
24 has pointed out -- Mr. Jakimchuk -- of --

25 Q You of all people I  
26 thought were aware of that.

27 A The difficulty with  
28 railroads is that you do not have a great deal of  
29 latitude in the routing of the thing because of the  
30 grade problems that you have, so you can't simply



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1 re-route the thing around a critical area if you  
2 happen to impinge upon one, not nearly as easily as  
3 you could do with a road, let's say, or with a gas  
4 pipeline. The second thing that concerns me is of  
5 course the very large amounts of fill that would be  
6 required, because again because of the grade restrictions  
7 a considerable amount of fill is required, and it seems  
8 to me that there would be a temptation in areas where  
9 there is a dirth of this kind of material to take it  
10 out of streams where it might affect fish populations.  
11 Those are my two major concerns with respect to railroads.  
12 As I say, I would classify them as equal to or possibly  
13 even more damaging than roads.

14 Q Dr. Gunn, did you wish  
15 to add anything with respect to the impact of a  
16 railway? I don't believe you mentioned that in your  
17 testimony.

18 WITNESS GUNN: No, I didn't  
19 mention that. I also consider it a serious problem  
20 but not as serious as a highway. Birds have the  
21 advantage that they can fly over oil pipelines so  
22 the problem is not as severe there as it is with  
23 Mr. Jakimchuk, but I would be concerned very much of  
24 any accidental spills from the line because that would  
25 get into water courses that are of importance to birds.

26 Q Mr. Dabbs, would you  
27 like to comment on this question?

28 WITNESS DABBS: There's not  
29 much point in my repeating the general concerns, of  
30 course, vegetation is of less interest and less  
glamorous than the concern of mammals, but I have a



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1 few points. The addition of other features such as  
2 an oil line or a road or railroad or so forth in the --  
3 within the general corridor, in each instance, results  
4 in the opening of another right-of-way. That in itself  
5 to me represents an impact that must be considered and  
6 lived with. So each time another facility is built,  
7 there's another right-of-way opened.

8 With regards to an oil pipe-  
9 line, there are a few points I might comment. My  
10 own interest, even though Mr. Jakimchuk wouldn't  
11 care for an elevated pipeline it certainly solves the  
12 problem of revegetation. But my understanding from  
13 our engineers in my own company in general discussions  
14 on this topic is that they feel there would be reason  
15 to believe that sections of the pipeline could be  
16 buried in the Mackenzie corridor and this then, I  
17 think, might result in a more difficult situation  
18 for revegetation, for erosion control, and for the  
19 provision of normal cross right-of-way drainage and  
20 maintenance of normal hydrological regimes, all of  
21 which I'm sure can be designed for but obviously  
22 would require a new design over and above what has  
23 been presented to this Inquiry relative to a gas line.

24 If an oil line was built on  
25 a berm construction, then of course there's a greater  
26 requirement for borrow material or if they are forced,  
27 for one reason or another -- and I don't know why -- but  
28 if they decided to adopt the Alyeska construction  
29 approach of also building a roadway associated with  
30 the berm, that then adds even more to the requirements



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1 of borrow materials, so each time something like this  
2 is added, there's a larger land area affected by  
3 borrow mining and consequently results in an additional  
4 problem of restoration. Again one I think that can  
5 be solved, but it does expand the scope of the problem  
6 relative to the gas pipeline.

7 I think a point of view from  
8 an erosion control and integrity of systems, whether  
9 gas lines or oil lines, roads or railroads,  
10 quite often in southern areas where we hear of failure  
11 of a pipeline or a pipeline broke and oil or whatnot  
12 got into a river, it's quite often associated with the  
13 impingement on that right-of-way by another utility  
14 service, whether it's a hydro line is being built,  
15 other pipelines being built, roads being built, just  
16 haul roads for logging often have to cross a right-  
17 of-way and the standards of these other utility  
18 rights-of-way are not always to the same high standards  
19 of an oil pipeline, and as a result an erosion problem  
20 initiated by peripheral activity which in itself might  
21 be controlled, quite often gets out of hand and  
22 results in a washout or cutting through of pipelines,  
23 and so there's always this right-of-way conflict.  
24 As Mr. Hemstock identified, there's not that many  
25 areas within the Mackenzie Valley where there would  
26 be this right-of-way conflict, competition  
27 of rights-of-way for a limited amount of land. Where  
28 there is, there is an increased potential for one  
29 system affecting the other system, and I make that  
30 comment strictly on the basis of past history of our



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1 experience in the south. From my point of view an  
2 oil spill has a greater potential for damage to vege-  
3 tation than a failure in a gas line and escaped gas.  
4 That to me isn't a serious problem with a gas system,  
5 so there is that point of view.

6 Now, I think as a final  
7 comment, if these lines and these facilities are construc-  
8 ted, as we are speculating here that a gas pipeline  
9 will proceed, an oil line and so forth, in each  
10 case the experience gained by the previous one should  
11 result in an improvement in technology or ability to  
12 mitigate environmental impact with each succeeding one  
13 because of the experience we learn, if programs are  
14 established to gain -- gather the right kind of data  
15 so that these data can apply to these experience,  
16 these experiences can apply to the next facility, and  
17 that, too, has been identified by the people who pre-  
18 pared the guidelines requiring a program of environmental  
19 monitoring, so that the next time something is built  
20 within this corridor, problems experienced by the  
21 previous one should be solved and we can get around  
22 them.

23 Q Dr. Banfield, have you  
24 some general comments to make?

25 WITNESS BANFIELD: Yes, I have,  
26 sir. Mr. Commissioner, I appreciate your problem.  
27 It's a serious one and I don't intend to duplicate the  
28 comments I made on cumulative impact in Whitehorse, but  
29 just to point out that what Mr. Dabbs has described  
30 actually is synergistic and was an example of synergistic



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1 impact of several utilities. I had hoped there would  
2 be some discussion of this here in Yellowknife, and  
3 I put two words in my direct testimony to indicate my  
4 lead-off point when I said that environmental  
5 impact assessment was a science or an art, because as  
6 a matter of fact it has a unique position in that  
7 it's exactly in the interface between technological  
8 and humanistic society's goals and the cumulative  
9 effect is a natural theoretical concern that has been  
10 introduced largely from the parentage of the humanistic  
11 society and social sciences' view point.

12 So it's a natural theoretical  
13 concern, but in fact it's very difficult to suggest  
14 a practical analysis methodology. The problem -- these  
15 sorts of things have a history and it was originally  
16 initially raised in the American National Environmental  
17 Policy Act in 1969, which I mentioned, and later in  
18 the Council of Environmental Quality Guidelines in 1971.  
19 I give you these dates simply because they pre-date  
20 the Mackenzie Pipeline guidelines, and I don't think  
21 that is a sheer coincidence.



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American  
In those/documents, the

concern was expressed slightly differently over a  
concern over the final effect of a sequential series  
of small decisions that lead to a very large environmental  
or sociological consequences and that was the way it was  
expressed there and the way the Americans have  
developed it and the way it turned up in the pipeline  
guidelines, you see is slightly different than that  
in that we are really assessing a very large project  
to begin with and it's really more difficult as you  
have discovered to respond to a guideline.

Well, I have been searching the literature for about six months trying to  
get some idea of how we might approach this problem  
and I haven't found much help. Part of the problem  
of why I haven't found much help is responses I have  
received in writing to government officials and there  
has been numerous mentions of the primary impact of  
the highways, particular the Dempster Highway, which is  
going through a first priority as you are well aware  
of.

I wrote both to the  
assistant deputy minister of the Department of the  
Environment as well as to officials in DIAND and  
with a view to trying to live up to my obligations in  
this Inquiry, to find out if I could get some information  
as to the environmental impacts of the highways  
and I was told that the environmental statements were  
working, internal working documents are not available



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1 to outsiders which is a tremendous constraint in trying  
2 to trying to respond to your question as to how to  
3 appraise the total environmental impact -- accumulative  
4 environmental impact.

5 Now, you have mentioned  
6 the one specific in which I have some information.  
7 For instance, a gas pipeline requiring 20 million--is it  
8 tons or cubic yards?

9 THE COMMISSIONER: It's 30  
10 million cubic yards.

11 WITNESS BANFIELD: 30 million  
12 cubic yards and an oil pipeline, 40. Now, the railway  
13 according to their document required 400 million cubic  
14 yards and that is about 50% of the total available  
15 resources that have been identified and this is  
16 the one area I tried to find out what does a highway  
17 require? This apparently isn't public information so  
18 this is just one of the areas in which we're stymied in  
19 trying to respond to your question.

20 I have already spoken  
21 theoretically about the problem of cumulative impacts.  
22 I have no further comment.

23 THE COMMISSIONER: Well, thank  
24 you, very much. This has been a digression but it  
25 serves to get counsel and others thinking about how  
26 we're going to handle this aspect of the thing.

27 The guidelines are inter-  
28 esting in that they contemplate that the two trunk  
29 pipelines, gas and oil are the principle components of  
30



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1  
2 the corridor. They were written in 1972. At that  
3 time, the highway had already reached Fort Simpson  
4 and it was regarded as a part of the landscape, I  
5 suppose.

6 It was in the same year  
7 that the government announced that the highway would  
8 be extended to the Arctic and we have now been advised  
9 that it will go to Fort Wrigley by 1979 and they have  
10 no further plans after that except the feeling that  
11 some day it will go to the Arctic.

12 But right at the moment,  
13 we have two companies that want to build a gas pipeline.  
14 We have a consortium in the wings that wants to  
15 build an oil pipeline. The federal government wants  
16 to complete the Dempster and has, for the time being  
17 shelved any plans of completing the Mackenzie Highway  
18 to the Arctic.

19 But there is one inter-  
20 esting facet to all of this and that is that these  
21 guidelines contemplate that if you, Arctic Gas get  
22 the right to build the gas pipeline from Prudhoe <sup>Bay</sup> across  
23 the North Slope down the Mackenzie Valley that an oil  
24 pipeline following generally that same route will be  
25 built.

26 So far, nobody has suggested  
27 that a highway is going to be built along the north  
28 coast. That is, no one has suggested that so far in  
29 this Inquiry. The Dempster of course takes a route  
30 through the interior, so that on the north coast where



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1  
2  
3 you gentlemen have been principally concerned from an  
4 environmental point of view, particularly with rela-  
5 tion to birds and the caribou, the only development  
6 that we have before us, so to speak, are first, the gas  
7 pipeline and secondly, the guideline say. The  
8 likelihood of an oil pipeline.

9 Now, the Beaufort Delta  
10 Group doesn't want to build a pipeline across the  
11 north coast. They want to build it from the delta  
12 but if the principle on which the Arctic Gas pipeline  
13 is sound, that is, that you bring both Alaskan and  
14 Canadian<sup>gas</sup> to the south in the same trunk pipeline, that  
15 might very well be the principle upon which others,  
16 following the guidelines which contemplate that very  
17 thing, might want to build an oil pipeline.

18 So that along the north  
19 coast, they're concerned with the gas pipeline and  
20 the only other development, the guidelines contemplate  
21 is an oil pipeline. Now, the railway is something that  
22 the C.P.R. and the C.N.R. haven't turned up here and  
23 they haven't turned up anywhere else and said wait  
24 for us, we want to build a railroad. Studies have  
25 been prepared but no one has gone any farther than that.

26 Well, Mr. Goudge, would  
27 you follow up what Dr. McCart and Dr. Banfield said  
28 about the studies prepared within the Department of  
29 Public Works and the Department of the Environment.

30 MR. GOUDGE: Yes, sir. I was  
going to say that if Mr. Marshall or any of his



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advisors feel the need of information that their having  
difficulty getting, we would be pleased to assist them  
and I'm sure the government will be cooperative.

THE COMMISSIONER: Well, there  
you are. No problem.

MR. GOUDGE: We'll do our best  
at any rate.

THE COMMISSIONER: Well, it's  
a good thing you are here today.

MR. MARSHALL: It's nice to  
know influential people.

MR. ANTHONY: Mr. Commissioner,  
I am grateful for the comments, the general comments of  
this panel and I look forward to the time when we will  
be able to examine these questions in more detail with  
them at an appropriate time.

The purpose of my question  
at this point is the one that Dr. McCart/<sup>suggested</sup>that they  
touched on in their evidence and really the only  
question I would like to ask before perhaps leaving the  
more detailed discussion when everybody is/<sup>more</sup>prepared  
to have this discussion, is to find out from all of them  
whether they are in the process of conducting any  
studies, as Dr. Banfield suggests he is attempting to  
do, and whether in their particular discipline and I  
started with Mr. Dabbs this morning whether he is  
looking at things like cumulative effects and their  
impact on the terrain and perhaps more directly to the  
Arctic Gas proposal whether they are looking at the



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1  
2  
3 problem of looping and the question of re-attendance  
4 and redisturbance. Whether these issues are being  
5 examined by them in anticipation that we're going  
6 to have to discuss these at this Inquiry at some  
7 date and maybe I should leave it at that. To  
8 determine whether or not, Mr. Dabbs, in his area of  
9 expertise is conducting any study or preparing any  
10 research in that area.

11 MR. MARSHALL: Well, if we're  
12 going to come back, we're going to go back in the Inquiry  
13 again and deal with this in more detail, what's the  
14 point?

15 MR. ANTHONY: Well, I guess  
16 the point is to find out whether or not they are  
17 studies proceeding along on these subjects and if  
18 there are, when they are expected and I think it would  
19 also assist us as we prepare our witnesses to comment  
20 on these subjects.

21 CROSS-EXAMINATION BY MR. ANTHONY (CONTINUED):  
22  
23  
24  
25  
26  
27  
28  
29  
30



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1  
2 Q The answer may be that they  
3 are not, if they are not in this case, that solves the  
4 problem.

5 WITNESS DABBS:

6 A I think perhaps the problem  
7 I have is your definition of studies. If you mean  
8 am I currently reviewing available literature on the  
9 topic, I would say yes I am. But in terms of designing  
a field research program, no I am not.

10 To answer a question you  
11 started to pose relative to the effect of oil or  
12 say crude oil, no I am not because there has been a lot  
13 of study in this field.

14 Q Is that going to be the same  
15 position with Dr. McCart as far as doing a literature  
16 survey, but no further studies that are outlined in  
17 evidence and so on, does not--?

18 WITNESS McCART: I think so.  
19 We obviously can't go out and build a pipeline or an  
20 oil pipeline to test, you know, its relative effect.  
21 We haven't even built a gas pipeline across a stream  
22 to do this.

23 So, I think we will think about  
24 it obviously if we are going to have to come back and  
25 discuss it in more detail. We will be doing that kind  
26 of thinking and those kinds of studies and see what  
27 we can make of it and if we could get information on the  
28 highway, we would include that in our thoughts too, as  
29 well as looping.

30 Q Mr. Jakimchuk?



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Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 WITNESS JAKIMCHUK: I basically  
3 don't have anything to add except apart from what Dr.  
4 McCart has said except that the ongoing studies at  
5 Chick Lake, what we call our monitoring studies, are  
6 in a sense, will be the first step towards assessing  
7 accumulative impact with respect to looping, say for  
8 example.

9 It is the first experimentally  
10 designed study that I am aware of. Before the fact of  
11 a development, that will continue following the fact  
12 of a development where quantitative data will be  
13 available.

14 In a sense, I view that as  
15 having quite a bit of significance with respect to  
16 looping.

17 Q Dr. Gunn, do you have any-  
18 thing further to add in your area?

19 WITNESS GUNN: Not really. We  
20 are following the literature but we have no field ex-  
21 perimental work planned. It has always been my under-  
22 standing that if looping were to be done, it would re-  
23 quire separate environmental impact assessment.

24 Q Thank you Mr. Commissioner.  
25 That is all the questions I have.

26 THE COMMISSIONER: Mr. Bayly?

27 MR. BAYLY: Mr. Commissioner,  
28 I am wondering, it's twenty after twelve and we usually  
29 break in ten minutes and I am a slow starter.  
30



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 THE COMMISSIONER: Okay, we  
3 will adjourn until 2:00 and will you Mr. Goudge discuss  
4 with Council the possibility of sitting Thursday  
5 evening and if all concerned wish to, then confine the  
6 Friday sitting until from 9:00 until 1:00, we might  
7 be able to do that. Okay, until 2:00.

8 (PROCEEDINGS ADJOURNED UNTIL 2:00 P.M.)  
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Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

THE COMMISSIONER: Go ahead,

Mr. Bayly.

CROSS-EXAMINATION BY MR. BAYLY:

Q Mr. Dabbs, referring to page 7 of your prepared evidence under "general objectives" due to, the foremost to stabilize the right-of-way from erosion and other problems that would be caused if you just ignored revegetation entirely and either let the plant communities come back or let them, realizing that in some places they wouldn't come back, that's No. 1 priority for your task in the environmental program. Would that be fair to say?

WITNESS DABBS: I think that's fair enough, yes.

Q No. 2 priority is to provide a situation where the native plant community can eventually come back into all areas except during the life of the pipeline on the right-of-way which the company wants to keep cleared so that it can carry on other kinds of maintenance besides revegetation. Would that be fair to say, that that's the second one?

A That's fair. I think it's a matter of degree just how far you allow the plant community to re-establish is the only difference, but yes, your summation is right.

Q Yes. I didn't want to go as far as to say you immediately wanted the entire plant community to come back because you certainly



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1  
2 don't want mature trees on the ditch mound during  
3 the life of the pipeline because there may be other  
4 things the company wants to do. But as far as the  
5 low shrub species and certain the grasses, you  
6 want those eventually to come back even during the  
7 life of the pipeline.

8 A Yes sir.

9 Q And your estimate is  
10 that this will happen with regard to the -- sorry,  
11 we'll take the first step, that within a period of  
12 one to three years you will be able to revegetate --  
13 this is after construction --you will be able to re-  
14 vegetate the right-of-way, not necessarily with the  
15 species that were there before but with either them  
16 or other species, or a combination.

17 A That's fair, yes.

18 That's our estimation.

19 Q Yes. Now, you have said  
20 on page 7 that you would revegetate all land surfaces  
21 disturbed, and I expect an exception to that would  
22 be those land surfaces that you cross that don't have  
23 any vegetation on them to start with.

24 A Yes sir.

25 Q Because unless for some  
26 reason your disturbance has caused a condition of  
27 instability, that you want somehow to artificially  
28 control because of the integrity of the pipeline being  
29 a prime consideration.

30 A Yes.



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1  
2 M R. MARSHALL: You mean by  
3 introducing vegetation where there wasn't vegetation  
4 before? That's what you mean by "artificial"?

5 M R. BAYLY: That's what I  
6 was suggesting there, Mr. Commissioner.

7 MR. MARSHALL: Not Dr.  
8 Vaartnou's artificial.

9 MR. BAYLY: I'm not suggesting  
10 an artificial type of turf or anything like that.  
11 I'm suggesting, though, that there may be areas on  
12 the top of eskers, for example, where vegetation is  
13 either sparse or doesn't exist, where if you cut a  
14 right-of-way through something like that, that may be  
15 a poor example but that you might want to vegetate  
16 where there originally was no vegetation in order to  
17 stabilize. Is that fair, Mr. Marshall?

18 MR. MARSHALL: Yes, it's just  
19 that I'd never thought that vegetation was artificial,  
20 I thought it was natural.

21 MR. BAYLY: Q But you would  
22 agree with me, though, Mr. Dabbs, that it isn't natural  
23 to have vegetation in all areas that will be crossed  
24 by the pipeline. At the present time there are areas of  
25 rock and sand and gravel where there is no vegetation.

26 A Quite right, quite right.

27 Q And that's quite natural.

28 A Yes sir, active flood  
29 plains being a good example.

30 Q And to introduce vegetation



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 would be something that would be artificial to the  
2 natural state, although it's unfair to call vegetation  
3 artificial. I think that's probably the root of the  
4 problem that Mr. Marshall and I are having..

5 A Yes, I think that's fair.

6 MR. BAYLY: O.K. now, Mr.  
7 Marshall?

8 MR. MARSHALL: Sure.

9 THE COMMISSIONER: When you  
10 said that's the root of the problem, I take it that  
11 was another heavy handed --

12 MR. BAYLY: No, that was quite  
13 inadvertent, Mr. Commissioner.

14 Q Now, do you have any  
15 evidence that will support your, either theory or  
16 conclusion that in all areas the natural vegetation  
17 is capable of coming back? Let me give you an  
18 example if <sup>that is</sup> a question that you can't quite focus  
19 on. I'm thinking of the northern boreal forest, say  
20 around the Inuvik area. Now, or in the delta itself,  
21 or if you use the interior route when you have to  
22 come into the vicinity of the Peel River, if you take  
23 the trees off to clear a right-of-way, do you have  
24 evidence as to whether those trees, those species of  
25 trees will come back or whether they will be replaced  
26 by other species natural to the area, perhaps, but  
27 not the same ones that you removed in order to create  
28 the right-of-way?

29 A The evidence we have is  
30 reported within the volumes dealing with the vegetation



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1  
2 surveys where we have discussed plant succession,  
3 both in rate and character of succession, but I be-  
4 lieve there is perhaps reason to conclude, as other  
5 authors have, that there could be areas where currently  
6 an open forest situation exists which evolved or  
7 established there under a slightly different climatic  
8 condition, and the removal of the trees today might  
9 result in permanent maintenance of an non treed  
10 plant community.



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

1  
2 Q I gather then you are ac-  
3 quainted are you with the paper by Professor Gill of  
4 the University of British Columbia called "Forestry  
5 Operation in the Canadian Sub-Arctic and Ecological  
6 Argument Against Clear-Cutting"?

7 A That particular paper isn't  
8 the one I had in mind but I am familar with the work.  
9 Dr. Gill has also published elsewhere his thesis on  
10 the effects of removal of tree cover.

11 Q All right. Just for the  
12 reference, for the sake of the record Mr. Commissioner,  
13 this is found in a volume called, "Environmental  
14 Conservation", Volume I, Number 2, Summer 1974 and it  
15 says at the bottom here printed in Switzerland.

16 I understand that Professor  
17 Gill is actually at the University of Alberta now.

18 A Yes, sir he is.

19 Q In that he says and I will  
20 and  
21 quote a passage with this / ask for your comments on  
22 it if you be good enough to give them to me. Starting  
23 on page 87 of this volume and I just have a photocopy  
24 of this particular article, "The Mackenzie River Delta  
25 supports a northern extension of this division along  
26 the delta's upper levees, there are a number of small  
27 clearings-- (Levees. LEVEES for the reporters.) --there  
28 are a number of small clearings where secondary plant  
29 succession is occuring usually resulting from the clear  
30 cutting of white spruce by eskimos for building material  
and fuel. These locations are normally adjacent to long



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

1  
2 occupied cabins around which the natives had cut the  
3 smaller spruce willow and alder for fuel. The upper  
4 and lower canopies are often completely removed in this  
5 process. A number of such sites in the extended study  
6 area indicated in figure one, were examined during 1966  
7 and 1967 and 1971, after which I concluded that a  
8 secondary succession was not following the usual trend  
9 of plant successions that culminates in a reestablishment  
10 of the original plant cover."

11 "Instead, a Heath Association  
12 has succeeded", in brackets called here the Tundra  
13 Association end of brackets, "which is similar in species  
14 composition to the low arctic shrub tundra adjacent to  
15 the Mackenzie River Delta".

16 Would that be the kind of thing  
17 you would say, expect to happen in a cleared right-of-  
18 way if you were to go through an area similar to the  
19 one that Professor Gill has described?

20 MR. MARSHALL: I think really with a very  
21 lengthy passage like that, perhaps you could make a  
22 copy of it available to Mr. Dabbs. I am sure it is  
23 much easier for him to respond, being familiar with the  
24 subject area, but it seemed to me that it was a pretty  
25 complicated message there.

26 A Now, the work that Don Gill  
27 has reported on here has been within an area of the  
28 delta proper, near Reindeer Station, I believe, north  
29 of Inuvik and I personally quite agree with his conclusion  
30 here and, but in response to your question, the first



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

1  
2 clearing, if you look at the, examine the pipeline route  
3 relative to the study that Professor Gill reported on  
4 here, will not take place until we get south of Inuvik.

5 And in this case we may or  
6 may not be in a situation where the open spruce forest  
7 is hanging on, so to speak, to a condition that it  
8 established before. Then again, the possibility does  
9 exist that in fact we might encounter that.

10 Q Yes, well in conversation  
11 with consultants for COPE, Professor Gill has stated  
12 his belief is  
13 that this condition is one which extends down to ap-  
14 proximately the area of Arctic Red River so it might  
15 be something that would become relevant if that were  
16 the case. Would you be in a position to either agree  
17 or disagree with him that this is a condition that  
18 would exist that far south?

19 A Well, I think perhaps we  
20 are both speculating on whether or not it would extend  
21 as far south as Arctic Red River. This past summer, I  
22 a member of  
23 and/my staff examined quite a number of forest sites  
24 between Inuvik, Arctic Red River, Thunder River in a  
25 general triangle and to attempt to place a boundary  
26 on where this condition might exist, I would think we  
27 would both be guessing.

28 But I would agree that this  
29 situation may in fact, or probably in fact exist for  
30 some portion at least of that area.

Q Yes. And we have had reports  
from some of the Inuit in the COPE region, that



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

1  
2 when they have in fact cleared sites for cabins through  
3 out the delta in general, that the original kinds of  
4 trees have not always come back, in fact have generally  
5 not come back. Even encroached into the clearing, they  
6 have generally been replaced with something else at  
7 least within living memory.

8 A That's right.

9 Q That would support this  
10 kind of theory. Would you agree with that?  
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Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Bayly

A Yes, I think that's how  
we felt.

Q Right. Now, the reason  
that I asked that is I want to lead you to Volume 14BN,  
tab 6.3.2, page 8.

MR. MARSHALL: Would you give  
the reference, please, Mr. Bayly?

MR. BAYLY: Yes, 14BN, tab 6,  
6.3.2, page 8, item 10. Now, I can read this. It's  
a single sentence rather than your having to look it  
up, sir.

It says, item 10,  
"Disposition of cut trees on slash will, unless  
otherwise directed by the authorities be by  
wintering burning over the ditch line."

Now, you said in your  
evidence earlier this week, Mr. Dabbs, or perhaps it  
was the week before last that if there were a market  
for the timber that you would recommend to Arctic Gas  
that it wouldn't have to be burned.

WITNESS DABBS: A I think  
both or I think that perhaps the fellow that made the  
comment was Les Williams but I would concur with his  
comment.

Q Yes, and this may be  
something that Mr. Hemstock will want to get into but  
as I read the producer application which is not yours  
but is one that, in a sense, relates to you because you  
need the gas plant, in order to transport gas through



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Bayly

1  
2 your facility, they require 16,000 pilings and in  
3 their application, they were suggesting that they  
4 would get them all from the area of the Peel River.

5 Recently, they've said  
6 that they would like to get only half of them from  
7 there and use steel pilings for the rest of the pilings  
8 and what I am suggesting to you by way of a question  
9 is we may be faced with a situation where you would  
10 have surplus timber suitable for piling somewhere  
11 along the line, north of the sixtieth parallel in  
12 areas where the trees might well come back when the  
13 pipeline company is finished with the right-of-way.  
14 Whereas if they are to take them from the delta area,  
15 the Peel River area, it may very well be that they  
16 will be removing a resource which will not come back.

17 Would you agree with  
18 that as a possibility?

19 A As a possibility, I  
20 would agree, yes.

21 Q All right. That's the  
22 first part of the question that it may be possible  
23 that this won't come back. Would you agree with the  
24 second part of the question that there are areas along  
25 the right-of-way which could provide timber suitable  
26 for pilings which perhaps the applicant and the  
27 producer, the producer-applicant would be able to  
28 purchase to use for the purpose of building the gas  
29 plants and facilities?

30 A I'm not familiar, myself,



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Bayly

with the specifications or requirements for piles but yes, I would agree with you that I -- that good straight, tall white spruce does exist on the right-of-way on the flood plains further south that I'm sure would make perfectly good piles.

Q All right then. Perhaps we could get one of the two orchestrators of the environmental program in on this discussion, either Dr. Banfield or Mr. Hemstock. Would this be perhaps a preferable use of resources to burning one set of logs and cutting another set where the burned ones might have done.

WITNESS HEMSTOCK: A Yes. We have indicated that any merchantable timber or any timber of any use would be made available along the right-of-way to anyone that could make use of it and certainly if it was of quality for piling it, that would be an obvious use for it.

I would point out though that it's likely that Arctic Gastoo will need pilings for certain parts of their compressor station so we would probably looking to our own right-of-way for whatever it would be there.

I think in terms of the total amount required, the right-of-way itself will supply a rather small portion of it.

Q Yes.

A I might just comment that



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Bayly

1  
2 I personally think there is a need and a use for  
3 even the smaller material which will be cleared from  
4 the right-of-way and I have recommended to the  
5 company that we considered chipping it and providing  
6 along the right-of-way stock piles of wood chips  
7 which can be used as a repair material and as an  
8 insulating material throughout certainly the  
9 construction and the early part of the operation and  
10 maintenance.

11 I would foresee very  
12 little burning of anything more than just the branches  
13 and very small material.

14 Q Now, if you were going  
15 to use chips for construction purposes, for repair  
16 of right-of-ways, etc., perhaps, Mr. Dabbs, you could  
17 indicate whether you feel that at least some of that,  
18 you would want to compete for for the sake of your  
19 plants because you did tell me earlier in cross-  
20 examination that, or sorry, I think it was Dr. Vaartnou  
21 who told me earlier in cross-examination that ashes  
22 are very good for plants and it wouldn't be a bad  
23 idea to spread them along the right-of-way by pulling  
24 them along with a sled. They would assist in the early  
25 plant growth of the re-vegetating species. Would you  
26 agree with that?

27 . WITNESS DABBS: A Yes.

28 And if item number 10 as read were in fact implemented,  
29 of course, the ash would be in place.  
30



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 Q So there are competing  
2 uses not only of people outside the gas industry but  
3 within the project itself there may be reasons to  
4 use some of the removed vegetative material for various  
5 things that are required for the entire project.

6 A I would agree with your  
7 observation that there may be a competition for the  
8 material, but I think it's not likely to lead to  
9 difficult - - it's not a difficult thing to resolve  
10 because the fertilizing value of the ash can certainly  
11 be achieved with fertilization, and if the wood  
12 chips are better used for building material, construc-  
13 tion material to fill in small basins, pockets that  
14 are created by mechanical accidents, that that might  
15 be a better use for it.

16 Q Well, we've been in the  
17 business in this hearing of weighing disadvantages  
18 against each other, but here we are weighing relative  
19 advantages, and what I'm interested in is -- and  
20 perhaps Mr. Hemstock can help me a bit here -- is  
21 how do you weigh this kind of competing set of  
22 advantages, Mr. Hemstock? There are various things  
23 you can do with the wood. You've recommended one.  
24 Mr. Dabbs for his purposes has recommended another.  
25 Certainly Mr. Williams, if he needs pilings, will  
26 recommend a third, and if we add the producers into  
27 it, as requirers of piling material, we have four  
28 possible uses for a single resource. How do you make  
29 that decision?

30 WITNESS HEMSTOCK: I think



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 we have to make it on the basis it is a judgment at  
2 the time that you're trying to decide how to use that  
3 resource.

4 Q All right.

5 A I don't think that you  
6 can decide ahead of time because if you do, you cannot  
7 properly consider all concerns.

8 Q All right. Well, if we  
9 add into the mix, the concerns outside the industry,  
10 for example those concerns that might be expressed  
11 by people living in the delta, that they'd like to be  
12 able to use some of the timber for building their cabins  
13 or they'd like to see some of the timber stay on the  
14 Peel River because it is creating -- it has created a  
15 trapping and hunting situation that they are accustomed  
16 to, perhaps clearing would create a different one  
17 that would be supportive of just as many animals, but it  
18 would certainly be different. That's something you  
19 have to weigh in too, which I suggest to you, sir, is  
20 something that we'd like to see weighed in as early  
21 as possible because they only get one chance to express  
22 it to you.

23 MR. MARSHALL: Well, Mr.  
24 Bayly, you can lead evidence about that. If you  
25 want to make a suggestion or recommendation, we're all  
26 ears. How can we help any more than saying these  
27 are possible uses?

28 MR. BAYLY: Mr. Commissioner,  
29 I'm prepared to wait my time to call evidence and it's  
30 now the turn of the applicant. I'm just suggesting



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 that this may be a convenient use. I'm not giving it  
2 as evidence, I'm raising it as an example, and if my  
3 learned friend has suggested that I'm giving evidence  
4 I don't want to mislead in that way.

5 MR. MARSHALL: I'd be happy if  
6 he would, sir. We're anxious to hear from Mr. Bayly  
7 about specific recommendations he has about specific  
8 things.

9 MR. BAYLY: Mr. Commissioner,  
10 I don't want to get into an argument over how the  
11 hearing is structured, but right now we're cross-examin-  
12 ing a panel of Arctic Gas' witnesses and I've raised  
13 an example. I will be giving evidence through my  
14 witnesses in due course to the best of my ability, and  
15 when that evidence comes out, sir, it will be before  
16 the Commission. At present this is only in the  
17 state of an example.

18 THE COMMISSIONER: Well, I  
19 think that you're entitled to put it to the witness  
20 so that when your own evidence brings it forward,  
21 we will have the advantage of hearing what this panel  
22 thinks about it.

23 MR. BAYLY: Q Let's put it  
24 this way, Mr. Hemstock. Is it possible to consider  
25 these things prior to what is popularly called the  
26 final design stage because there may be inputs other  
27 than those of the company that are competing uses?  
28 Now in gravel you have the granular resources  
29 inventory of the government, and here you may have  
30 somebody at a community hearing get up and say that



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 they would like to use some of the trees for one use  
2 or another, or you may get neither but still be in a  
3 position of wanting to consider that even though nobody  
4 has actually thought of the fact that it may not  
5 return, if you use it.

6 WITNESS HEMSTOCK: Well, I  
7 think that we have very little control over what would  
8 happen to those resources. When we request the per-  
9 mission to clear the right-of-way, that is generally  
10 a part of the stipulation, the method of disposal of  
11 materials, and that will be a proper government authority.  
12 You spoke about the harvesting of pilings in the  
13 Fort McPherson area. Again, if that harvesting is to  
14 take place, it will be done under permit. It seems to  
15 me that it's our job simply to say what we need, to  
16 make a suggestion of how we might obtain it, and that  
17 we will require the necessary government permits to  
18 obtain those particular resources, and we can't  
19 decide ahead of time how that should be done.

20 Q I can appreciate that  
21 you can't pre-judge, Mr. Hemstock, what permits will  
22 be given and for what uses; but may I submit to you  
23 that you, as the environmental panel, have come to  
24 us stating in broad and general terms that you have  
25 tried to consider as much as possible the environmental  
26 problems, stresses, etc., that this project will  
27 raise, and to mitigate against those as much as pos-  
28 sible, and I'm just suggesting to you, sir, that one  
29 of the ways of doing that is to, in your application,  
30 to note -- or in your following material -- to note



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 what you would like to see done with various resources  
2 and what you as a person directing environmental  
3 studies would recommend to any authority that would  
4 be granting permission to be done with the various  
5 things to dispose of them. Now you've already done  
6 that in Volume 14-DM by saying that it should be burned  
7 on top of the right-of-way. Now we have several  
8 other possibilities and all I'm suggesting, sir, is  
9 that these are things that the applicant might well  
10 from an environmental point of view want to consider,  
11 and at some point come up with a proposal that's  
12 taken into account whatever the various competing  
13 uses are, whether they be in the company or outside.



Banfield, Dabbs, Gunn, Hemstock  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

1  
2 A With that we have said  
3 that one of the alternatives is burning and we have  
4 recommend<sup>ed</sup> that materials <sup>that</sup> are not useful be burnt.

5 I have suggested that the  
6 material which is normally, the smaller timber would be  
7 useful to Arctic Gas as an environmental or, building  
8 material and that it should be chipped.

9 The other material we have  
10 stated, the merchantable timber will be limbed and  
11 stacked along the side of the right-of-way. It would  
12 be available then on a priority basis for whatever you  
13 see, again the authorities would suggest and I have  
14 suggested that there are probably competing uses for  
15 that material.

16 I don't think it is a matter  
17 of environmental concern particularly where it is used,  
18 just as long as it is usefully put to a purpose.

19 Q Yes, and I suggest to you  
20 that it is possible to use some of that material in  
21 such a way as to perhaps avoid the use of say, material  
22 on the Peel River which would not come back.

23 Even though in some ways you  
24 would have to face the possibility that it might cost  
25 more dollars to do so.

MR. MARSHALL:  
Well, I don't that Arctic

26 Gas has suggested taking materials from the Peel River  
27 area. You are mentioning the producers--

MR. BAYLY:

28 Q I didn't say that they did  
29 Mr. Commissioner. I am just saying that these-- I've  
30 got an answer that these would be available to anybody



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

1  
2 who wanted to use them. Now certainly Arctic Gas and  
3 the producers are not the same people in law. But in  
4 many ways they are the same people because the same  
5 companies form the one consortium that build the  
6 plant and if they are not Arctic Gas, they are Foothills.

7 By way of suggesting to the  
8 applicant that certain things be done, I am expecting  
9 that this information gets back to the producers who  
10 are an essential ingredient to this pipeline. If they  
11 don't produce any gas, there is no sense being here.

12 MR. MARSHALL:

13 I should have thought that  
14 if anything was clear if this Inquiry, it is that the  
15 producers have and probably always will have their own  
16 separate identity. It is made clear that they are  
17 going to be giving some evidence here. Surely they can  
18 speak themselves.

19 THE COMMISSIONER: Do you think  
20 that they will resume their own identities through all  
21 this?

22 MR. MARSHALL: Well --

23 THE COMMISSIONER: You raised the  
24 question Mr. Goudge. Maybe you can help us out here. We  
25 know that the producers and Mr. Ballem, their / <sup>counsel,</sup> have  
26 received copies of the transcript  
27 and I understand that arrangements are being made for Mr.  
28 Ballem to call evidence on behalf of the producers in  
29 Inuvik. Would it be better for Mr. Bayly to raise these  
30 matters there? What do you suggest?

MR. GOUDGE: Well, sir I am  
confident that Mr. Ballem will have a panel there that



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

1  
2 will be available to answer this kind of question,  
3 including I think, my understanding is he hopes to have  
4 effectively a policy panel where he will have represen-  
5 tatives of each of his/<sup>sponsor</sup>clients who are prepared, I  
6 think, to speak the company policy.

7 MR. BAYLY: I am content with  
8 that Mr. Commissioner. I do run into this problem  
9 though from time to time where you do get the answer  
10 "that it is not us, it is them," where it looks to the  
11 general public as/<sup>though</sup>we are dealing in some way with the  
12 same organizations and companies behind both applicants.

13 I would hope that there would  
14 be that kind of discourse between them that at some  
15 point we would get/<sup>back</sup>a combined opinion of whether the  
16 things that we would want to suggest to both of them,  
17 could be done.

18 Because I don't want to be in  
19 the position, sir, of having my client suggest one thing  
20 to one applicant and have them say, yes that's a good  
21 idea and the other applicant saying, yes that's a good  
22 idea but it depends on somebody else. If they both  
23 say that, then I feel that perhaps we are no farther  
24 ahead.

25 I am prepared to leave it there,  
26 but that is just my general reason for asking questions  
27 about the application of the producers even to the panel  
28 of the Arctic Gas applicant of the trunk facility.

29 MR. MARSHALL: Well, I feel  
30 in as much as/<sup>it</sup>has been indicated by Commission Counsel



Banfield, Dabbs, Gunn, Hemstock  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

1  
2 that Mr. Ballem has been retained by the producers and  
3 that they intend to give evidence and it would really  
4 be improper of me to allow Arctic Gas witnesses to speak  
5 on behalf of somebody who is seperately represented by  
6 counsel. It will be before the Inquiry, so that is the  
7 reason Mr. Bayly why I don't think really witnesses I  
8 call should be asked about those questions.

9 I think really they ought to  
10 be addressed to Mr. Ballem and I am sure he will co-  
11 operate in getting the answers that you require.

12 THE COMMISSIONER: Well, Mr.  
13 Bayly said he is content to leave it there so we'll  
14 leave it there.

15 Q Now, going back Mr. Dabbs  
16 to your schedule of-- You wanted to say something?

17 A No.

18 Q --to your schedule of a  
19 one to three year period for the restoration of the  
20 right-of-way to a vegetative condition, be it by natural  
21 seed, agronomic species or a combination. There is a  
22 concern expressed in the pipeline assessment group's  
23 concerns at page 260. It deals with the problem of  
24 whether there will be disturbances despite reseeding  
25 and I begin at the bottom of page 260, the first column  
26 starting with the sentence Hernandez in 1973 has noted  
27 and going through those next two paragraphs.

28 THE COMMISSIONER: What page  
29 is that again?

30 Q 260, sir.



Banfield, Dabbs, Gunn, Hemstock  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

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"  
is Hernandez has noted?"

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sir.

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THE COMMISSIONER: And where

Q First column, bottom line,

THE COMMISSIONER: Right.

Q For the benefit of the record

the discussion is that Mr. Hernandez felt : that

one to three years restoration of the natural

soil and energy budget does not appear possible by

reseeding alone. That the applicant's results don't lead

the assessment group in any event to believe that seeded

grasses can quickly restore perma frost levels to their

pre-disturbance state and he gives a much longer time

based on some work done by a Mr. Zolti and Mr. Tarnocai

in 1974 where they studied the situation after a fire

that suggested that the perma frost table in hummocky  
years

terrain began to rise sixty to eighty /after the es-

ablishment of trees and maintained its pre-disturbance

levels by one hundred years but that the organic layer

did not develop its pre-disturbance thickness for at

least one hundred and fifty years.

It goes on to say that Mr.

Zolti and another person Mr. Pettapiece had previously

estimated that following disturbances such as fire,

several vegetation cycles of about one hundred and

fifty years each were required to restore the full

organic mat.

Now is that something that

you would agree with, Mr. Dabbs, that in fact for the



Benfield, Dabbs, Gunn, Hemstock  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

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full restoration we would be faced with a much longer  
period or do you feel that something to do with re-  
placing the shredded mat will change the length of time  
of that process?



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Bayly

1  
2 MR. MARSHALL: We are talking  
3 about the energy budget, just so I can follow this  
4 replacement of restoration of the energy budget of  
5 the soil?

6 MR. BAYLY: Yes, we're really  
7 concerned with the re-establishment, as I understand  
8 it, from this passage of the permafrost active layer  
9 depth to its original state and this appears to take  
10 a very long time compared to your one-to-three year  
11 estimates. How does this tie into your feeling that  
12 within one to three years you will have a re-vegetated  
13 pipeline right-of-way?

14 WITNESS DABBS: A Well this -

15 THE COMMISSIONER: You have  
16 seen this passage before, I take it, Dr. Dabbs?

17 A Yes, I have responded  
18 to this, in fact. The whole discussion, sir, is a  
19 matter of clarifying some terms here. One, I am  
20 establishing in one to three years, re-vegetation  
21 program that will result in re-establishment of a  
22 plant cover in one to three years. That's one thing.

23 People have as here  
24 and in other discussions with myself have confused  
25 that with restoration of the thermal inter-relationships  
26 which would restore the predisturbance depth of  
27 seasonal thaw on the active layer. That's another  
28 situation.

29 The two are not the  
30 same thing.



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Bayly

Q All right. Well, would you agree though that where -- and I accept that and recognize that in asking the question, that plants will grow in one to three years, but that's not the whole story because it doesn't restore the thermal regime to the way it was before. What I am concerned with is whether in areas you anticipate this to result in ponding, slumping or any kind of degeneration to the right-of-way despite the fact that your plant cover may have re-established as successfully as you could hope?

A Well, the re-establishment of a plant cover for the erosion control, sir, is alluvial erosion control. That's running water and surface soil erosion. This is not the restoration that by seeding/would result in the re-establishment of the permafrost relationships here. We have never stated that seeding alone would restore the permafrost. I would be a fool to have said anything like that and I think what has lead to all of this confusion is a prediction I made in the initial, in the application at the outset, that in one to three years accommodation of seeding and the active chilled pipeline would restore the permafrost.

Now, it's the presence of a chilled pipeline that will restore the permafrost's level, not the seeding alone. The seeding as shown on the data of from the heat plots measurements, our test plots at Sans Sault does influence the amount of



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Bayly

1  
2 heat energy that is absorbed by the soil surface but  
3 in no way does seeding restore the normal heat energy  
4 budget which would result in the restoration of  
5 permafrost to its predisturbed condition.

6 Q Right now, that involves  
7 then if the two go hand in hand, they have to happen  
8 at the same time. Would you agree with that?

9 A Well, the reason for  
10 the span of one to three years was taking into consid-  
11 eration that there could be one or two inactive seasons

12 Q Well, this was my concern  
13 We are going to have one to two seasons and in some  
14 areas, longer because the pipeline will be built over  
15 a period of time that we already have a new suggestion  
16 that it would take four years rather than three years.

17 There would be lots of  
18 pipe in the ground empty, warm and you will have  
19 planted your grass then by that time. Is that fair to  
20 say?

21 A Yes, sir.

22 Q So during that period of  
23 time prior to the introduction of chilled gas but  
24 subsequent to reseeding, is it fair to say that we can  
25 expect to see on the Arctic Gas right-of-way the same  
26 sort of thing that you see on the Pointed Mountain  
27 line and that, what I mean by that is that the right-of-  
28 way may be level but that there may be a little pond  
29 or ditch in some areas where the pipe is actually  
30 buried?



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Bayly

1  
2 A I think this has been  
3 discussed with Mr. Williams and Dr. Clark, that in  
4 fact there will be places where there is sufficient  
5 excess ice in the backfill, that given time to thaw  
6 down an extra depth of thaw, there will be settlement  
7 and if that takes place and there is ponding or danger  
8 of ponding, there will be need for the addition of  
9 additional backfill or if during construction they  
10 find that there is a lot of excess ice in the fill,  
11 then it's those areas that they would use selected  
12 backfill or other backfill other than the native  
13 material in order to overcome the problem that you  
14 are just describing here.

15 But, as far as the  
16 point you made, I have just about lost it now. I got  
17 off into the --

18 Q What I was hoping you  
19 were going to answer actually was are we going to  
20 expect to find <sup>it</sup> in some areas?

21 A I would think that you  
22 could expect to find in some areas that that would  
23 happen but my estimation of this is based on  
24 information from Mr. Williams and Dr. Clark.

25 Q Well, does this influence  
26 your choice of grasses in some areas? Do you want  
27 grasses that can be up to their knees in water for  
28 a period of time?

29 A Well, in those situations  
30 where this could take place would be--



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Bayly

1  
2 THE COMMISSIONER: This is  
3 the kind of question I understand.

4 MR. MARSHALL: I wish you would  
5 help me, sir. I am trying to visualize these knock-  
6 kneed plants.

7 MR. BAYLY: This is for the  
8 sake of Mr. Edwards who says he keeps falling asleep  
9 during my cross-examination.

10 A No in the situations  
11 where this condition could exist or could develop into  
12 catchment area for holding water, I would suggest that  
13 those areas would naturally be quite wet. They would  
14 be level or depressional naturally.

15 And in that case, we  
16 would have known either now or at some point before  
17 this is built, that that is an area subject to excess  
18 soil moisture and for those situations we would have  
19 as I have identified in Appendix "C", the inclusion of  
20 meadow varieties that are adapted to the wetter  
21 conditions.

22 Now, as far as their  
23 ability to grow in water up to their knees, I have  
24 a hard time defining a knee of a grass but if it gets  
25 too deep, most grasses are simply not going to grow.

26 Q Some of them will die  
27 because of that?

28 A There will be a flooding  
29 out, yes.

30 Q Yes, and have you chosen



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Bayly

1  
2 species that are more resistant to this kind of state  
3 of existing through ponding periods? I guess that's  
4 why you have chosen meadow varieties.

5 A That's what I think I  
6 have just said, that where the conditions are ripe for  
7 the development of this situation, there would be  
8 species in there that are naturally adapted to these  
9 wet conditions.

10 Q Right. Are there also  
11 natural species that are ones that you would put into  
12 your seed mixes that would be particularly good at  
13 existing under these kinds of conditions?

14 A I don't think we'd have  
15 to, sir. I think if you recall the one slide I showed  
16 of the one test section at Sans Sault, where  
17 in the foreground there had been some ponding in those  
18 situations the native species particularly the  
19 sedges, the carices invade and establish very rapidly.  
20 And do so much more successfully than any seeding  
21 program.

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Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 Q In response to cross-  
2 examination mainly from Mr. Gibbs, you stated that  
3 the agronomic species that you want to introduce are  
4 ones that if they had been ones that would take over  
5 the plant communities here, they would have already  
6 done so because they would have come downriver and  
7 established themselves; is that correct?

8 A I think that was my  
9 point.

10 Q Yes, and they would be  
11 carried by water, by birds, by whatever means, by  
12 man in his pockets or in his early attempts to farm  
13 the Mackenzie Valley, and that would have happened  
14 already.

15 A Yes sir.

16 Q Now, none of these means,  
17 for some of the grasses, I would submit to you, involves  
18 actively putting them into the ground and giving them  
19 the kind of fertilizer that they need to establish.  
20 Is that fair to say?

21 A The sites suitable for  
22 their establishment along the Mackenzie River itself  
23 are generally warm, fertile soils, and they are better  
24 than even planting as proposed there, covered with a  
25 nice little layer of silt, so I couldn't plant them  
26 any better than that. But airport situations in all  
27 of the communities, of course there is a situation  
28 where there is active care in planting. The  
29 Experimental Station in Fort Simpson, of course,  
30 there is a lot of activity. There over many years,



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 where there was a lot of care taken to grow them,  
2 plots established, as Dr. Vaartnou mentioned in  
3 Inuvik by the Department of Agriculture. All of these  
4 cases, they have been given this additional care to  
5 get them established. In other cases of course you're  
6 right, they haven't had.

7 Q Yes, but what I'm  
8 suggesting to you, sir, is that they will remain.  
9 Some of them will remain and not be entirely choked  
10 out by the native species. Would that be a fair  
11 prediction to make?

12 A I would think that's a  
13 fair prediction that some of them have the ability  
14 to remain in a depressed state.

15 Q Well, if they remain  
16 and your prognosis is right that they are unlikely to  
17 invade the whole of the Mackenzie Valley, would you  
18 tell me whether you have any opinion as to whether  
19 they might be the kinds of species, or some of them  
20 might, that would revegetate or would migrate to  
21 other disturbed areas, either disturbed areas caused  
22 by man or naturally disturbed areas -- slumps and  
23 hill slides and this sort of thing?

24 A First part of your  
25 statement in regards to their remaining or even  
26 establishing in other areas, they would establish only  
27 if there is an opening provided, or they have the  
28 ability to exist within a community, and whether or not  
29 they would invade other disturbances subsequent to  
30 all of this we're discussing, I would think there is a



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 possibility they may form part of a pioneering coloniz-  
2 ing community in other disturbances. That's a reason-  
3 able expectation, I think.

4 Q Well, you've given us a  
5 list of species which fall into the definition of  
6 pioneer species, those are species that begin to  
7 colonize in disturbed areas readily; is that correct?

8 A Yes.

9 Q But they are species  
10 that those of us who have southern Canadian backgrounds  
11 recognize as ones we see growing along roadsides,  
12 in fields, in hay crops, etc., and they don't need to  
13 continue to be planted, they continue to grow without  
14 that in a lot of areas is that correct?

15 A They will continue to  
16 exist in a "pioneering state" only as long -- only if  
17 the area is maintained physically in that pioneering  
18 state. In other words, if that area, wherever your  
19 example may be, was simply left to plant succession  
20 to run its course, they would be replaced. By definitio  
21 they are only able to -- they are pioneers because  
22 they are able to establish in a lack of competition  
23 from other plants.

24 Q Well, would it be fair  
25 to say, though, Mr. Dabbs, that the pioneering species  
26 was so successful in areas of the prairies that the  
27 grasses, the pioneering species have in large remained  
28 whereas the native species, the actual prairie grasses  
29 that were there when the buffaloes and Indians were  
30 about the only people and animals roaming in large



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 numbers around, they've disappeared.

2 MR. MARSHALL: He obviously  
3 doesn't know about the gophers.

4 A The success of these  
5 materials are due to their maintenance in some dis-  
6 turbed form. Grazing is a disturbance. The cropping  
7 of the grasses for forage, otherwise they will be  
8 replaced. That's a law of nature.

9 MR. BAYLY: Q I understand  
10 that, but you're not the only pioneer wanting to come  
11 into the Mackenzie Valley now. We've just heard this  
12 morning this panel talk about the fact that they,  
13 as an environmental panel, are aware of the other  
14 pioneers -- the oil pipeline people, the road people,  
15 the possibility of the railroad people.

16 My concern is, and I invite  
17 you to comment on it, we may establish a very large  
18 area of disturbance in the Mackenzie Valley which  
19 pioneering species may entrench themselves in for a  
20 very long period of time.

21 A Along the roadways  
22 where the grass is kept cut, the shrubs are kept  
23 down, to maintain that roadway, yes, then they will  
24 continue to stay in those situations. If the road  
25 is abandoned then you'll see the same thing as you'll  
26 find in places along the Canol Road now where the  
27 trees have invaded, the birch being almost a pioneering  
28 if you wish, tree, an early establishing tree, the  
29 birch having encroached on that road. So as long as the  
30 road is operated and maintained, is kept in some state



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 of disturbance, then they will remain, yes.

2 Q Well, is it not true,  
3 though, sir, in plant communities you do get into  
4 situations sometimes where you have enough disturbance  
5 and so little of the -- I'm not suggesting that this  
6 will necessarily happen in the Mackenzie Valley, but  
7 there's so little of the native species left that  
8 even should the disturbance, as such, cease, that the  
9 species that come back will not necessarily be those  
10 that were there before? Some of them may disappear.  
11 Now I'm not talking about an entire community, but  
12 members of that community may fall by the wayside.

13 A Given the time frame  
14 which is considerably more than our lifetime or our  
15 several lifetimes, very often the likelihood is that  
16 those plants that are adapted to or that have evolved  
17 in place in plant communities, as you have described,  
18 will re-establish. I could theorize that there may,  
19 in time be an exclusion of one or two species that  
20 were lost hundreds of years previously, but I really  
21 think this is very hypothetical.

22 Q All right now, it may  
23 well be hypothetical, but the reason I ask it is to  
24 lead you into this other area now that, would you  
25 agree with me that the native species that exist  
26 now in the area that you wish to put the pipeline, are  
27 soil builders, they build a certain kind of soil and  
28 they have been building that kind of soil for many  
29 thousands of years?

30 A Yes sir.



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 Q And that if you were to  
2 introduce pioneering species or other species, perhaps  
3 equally as hardy, perhaps able to withstand different  
4 or more severe conditions even, that they would add  
5 different things to the soil, or a different combination  
6 of the same things?

7 A I don't know what else  
8 they would contribute to the soil. The basic ingredients  
9 of the plant is incorporated there. The nature of  
10 the rebuilding of that soil could be altered in some  
11 way say along a roadway particularly where the soil  
12 per se that is built up in much of the valley is  
13 mostly an accumulation of organic material that is  
14 largely undecomposed, and re-establishment of that same  
15 type of thick organic soil may take an awfully long  
16 time, or may not re-establish.

17 Q Yes, I think I used  
18 the term "soil" when I perhaps should have included  
19 in that the matted vegetative material, dead and  
20 alive, that covers that as a unit that creates itself,  
21 that's a dynamic, if we can call it that.

22 A I've used it that  
23 way in my comments.

24 Q So we may find that there  
25 are some different things happening in that system  
26 with the introduction of pioneer species that may for  
27 one reason or another be caused to stay for a long time.

28 A Well, sir, I think we're  
29 going around and around here, because pioneering  
30 species exist. We simply have to disturb a site or



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-EXam by Bayly

1 take a look at a seismic line, take a look at a natural  
2 landslide, pioneering, the role that the plants play  
3 whether they are brought in from Northern Alberta or  
4 whether they're found here, they play the same role  
5 until they have altered the site sufficiently that  
6 other species can then invade, establish themselves,  
7 and the process works itself through.

8 Q I'm with you, Mr. Dabbs.  
9 I've used the wrong word. I meant "agronomic", to add  
10 the word "agronomic" to "pioneering species" because  
11 they are different pioneering species from the ones that  
12 presently live in the valley.

13 WITNESS JAKIMCHUK: Mr.  
14 Bayly, may I interject here for a moment?

15 Q Certainly.

16 A I realize I'm not a  
17 plant ecologist. However, you did use the word "buffalo"  
18 and --

19 (LAUGHTER)

20 -- I feel entitled to clarify a remark. I believe this  
21 line of questioning started with you stating or  
22 implying that agronomic species have displaced natural  
23 grass communities on the prairies. Well, that is not  
24 so. The short grass prairie in Alberta and Saskat-  
25 chewan is dominated by a species called blue gama  
26 grass, *bouteloua gracilis*. I was just down in the  
27 short grass prairie last week and once again I was  
28 impressed with the fact that even in the raising of  
29 cattle, cattle have replaced bison as the major  
30 grazers in that community. Even with the extensive



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 cattle ranching that does occur, there are very few  
2 attempts to cultivate that land for the production  
3 of domestic grasses because of the constraints,  
4 climate and soil. So in point of fact, there has not  
5 been a displacement on the short grass prairie. The  
6 short grass prairie is by and large extant.

7 Q You would agree with  
8 me, I expect, Mr. Jakimchuk, that when you do try  
9 and do that you very often end up with some sort of  
10 a disaster, you end up with an area that the dust  
11 blows around in and it's better in areas like that  
12 very often to leave the species from the point of view  
13 of the security of the plant and soil system.

14 A Well, there are extreme  
15 examples of disasters. I don't wish to become embroiled  
16 any further except to make that particular point.

17 Q Yes, and I appreciate  
18 that, sir. But this has been a concern, Mr. Dabbs,  
19 expressed by people on both sides of the Canadian-  
20 American border that the prairie grasses, albeit over  
21 a great long period of time, put something into the  
22 soil which made them very fertile from the point of  
23 view of growing what we traditionally know as grain  
24 crops, but that we couldn't replace a lot of that  
25 with some of the fertilizers that we tried to use  
26 without finding that we had to keep adding more and  
27 more of them just to keep up. Is that fair to say in  
28 a layman's approach to your topic?

29 MR. MARSHALL: Does that have  
30 anything to do with what we are here about?



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 MR. BAYLY: Well, Mr.

2 Commissioner, the reason that I raised this question  
3 is not because I'm trying to revegetate the prairies.

4 MR. MARSHALL: Thank you.

5 MR. BAYLY: But I am concerned  
6 with the fact that a different plant regime may be  
7 introduced into the Northwest Territories that may last  
8 a lot longer than the length of time that it is pro-  
9 posed that gas be taken out by Arctic Gas. We have  
10 already heard that there are other facilities, there  
11 are other possible disturbances to which these species  
12 could migrate. This could last over a period of many  
13 decades, and what I am trying to do now, if I may, is  
14 to analogize from a situation that Mr. Dabbs knows  
15 to the possibility of there being a regime, a system  
16 of plants and soil established here that may be in  
17 trouble if these species do take over large areas  
18 because of continued disturbances.

19 THE COMMISSIONER: Well, I  
20 think that links it up to our present concern and  
21 Dr. Dabbs, go ahead and comment on that proposition.

22 WITNESS DABBS: Well, whether  
23 you attach the prefix "agronomic" or whether you don't,  
24 they both play the same role, for a short period of  
25 time. The truth of the matter is they are, being of  
26 the same genus, the grasses, plants that would invade  
27 a natural disturbance, they perform precisely the  
28 same role with almost precisely the same plant body,  
29 the same plant parts, the same breakdown components.  
30 If you were to -- if you had come with the Commissioner



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 and examined the Sans Sault test-site, you'd have  
2 seen the fact that they are soon replaced, even within  
3 a few years by other native pioneering species and  
4 species who have found the site then suitable for  
5 their invasion, they would be secondary in the success-  
6 ional process, and your fear of their persisting for  
7 a long time would soon be removed from your mind if  
8 you were to observe. It's one thing, as I say, to  
9 look at a . . . table of data, and we could do that;  
10 but the more convincing is to take a look at these  
11 plots and see how in five years they are replaced  
12 by other native species in a more diverse complex  
13 community being built up there, which follows the  
14 normal succession process, had we seeded it or not.  
15 All we have really done by seeding it is reduce the  
16 time period between initial disturbance and initial  
17 colonization which if left be, maybe several years.  
18 Sometimes it's only a year, depending on the situation,  
19 and the seeding program is only one of eliminating  
20 that time period where there is no protection. But  
21 the function these plants play in the total restoration  
22 of the area is precisely the same as any native  
23 material.

24 Q All right, well let me  
25 lead you down another road, if I may, and that is this  
26 one, that -- and I think it's relevant, Mr. Marshall --  
27 I saw you getting closer to the microphone.

28 MR. MARSHALL: I'm must turning  
29 my best ear, Mr. Bayly, that's all.

30 MR. BAYLY: You have stated



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 that there are going to be areas where you will expect  
2 disturbance and the necessity of doing your reseedling  
3 project where either something has disturbed the seeds  
4 or where they've drowned out, or where repairs have  
5 had to be done and spoiled your plot. Should this  
6 have to be done in a single area several times, I'm  
7 assuming that quite a lot of fertilizer would -- I  
8 mean quite a lot of applications of fertilizer might  
9 be used, say one for each seeding. Is that fair to  
10 say?

11 A Not necessarily, but  
12 generally that might be the approach.

13 Q Yes, so it might well  
14 be that if there were a particularly difficult area  
15 or a series of particularly difficult areas there  
16 might be several applications of chemical fertilizer  
17 to the soil, perhaps having nothing to do with the  
18 soil's capabilities but having to do with some  
19 mechanical problems that necessitated re-disturbance.

20 A That could be.

21 Q Now have you done studies  
22 on the soil in the various areas? I realize your  
23 main studies have been done at Sans Sault, but in the  
24 various areas to determine what happens to this organic  
25 material which has only partly decomposed over a very  
26 long period of time, if you keep adding fertilizer  
27 several times over a short period of years? Will it  
28 change?

29 A I can't say that we have  
30 had a particular program along those lines with those



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Bayly

1 objectives. If it's required in the first example, as  
2 you were building it there, that there is a need for  
3 repeated seeding and perhaps fertilization, that would  
4 be in a case where you have exposed mineral soil,  
5 not one of organic soils. So whether or not we have  
6 to repeatedly/<sup>seed and</sup>fertilize an area of mineral soil doesn't  
7 have anything to do with what repeated fertilization  
8 of organic soil would have, mean, because in those  
9 cases they are in depressional or level areas to have  
10 built up that amount of organic material, and there  
11 would be no need really for repeated maintenance of  
12 those kinds of sites, so the possibility of your  
13 first example taking place in an area where there would  
14 be deep organic soils, I don't think exists.



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Bayly

1

2

Q All right, now if

3

removed though from mechanical disturbances to

4

disturbances by the creatures that are <sup>not of the</sup> concern of

5

you but in particular of Mr. Jakimchuk and various

6

other people on your environmental panel, Dr. Gunn,

7

being one. If in certain areas animals or birds make

8

it necessary to re-vegetate either a hundred foot

9

stretch or more, you may be in low areas. I know

10

they are not going to eat the fertilizer and that

11

may be what you are going to try and tell me and maybe

12

that's all you have to say that you don't have to

13

refertilize.

14

A I think if you recall

15

Dr. Gunn's slides yesterday, the birds did a lot of

16

eating and they did a lot of fertilizing too.

17

Q Well, would that be

18

sufficient for your grasses?

19

A Well, there may be

20

a need for some small addition of fertilizer.

21

Q Yes, it's good enough

22

for the native species, I take it.

23

A It seems to be, yes.

24

Q Yes, but you want to

25

make sure you have --

26

A In an area

27

where there is very little or no erosion potential,

28

it simply happened to be picked clean by geese, we

29

wouldn't be excited in any way to rush out there

30

with a lot of seed and fertilizer because it isn't



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Bayly

1 going to go anywhere. There's no erosion potential  
2 in that case.

3 Q All right. But may I  
4 suggest to you there is in the first couple of years  
5 that problem associated with ponding, with slumping  
6 because there may be no gas, no chilled material in  
7 the pipeline and that's what -- one of the things  
8 you want to preserve by getting these grasses to  
9 grow quickly?

10 A If there is going to  
11 be ponding or slumping that's a situation that all the  
12 grass seed in the world isn't going to solve. That's  
13 an engineering problem but if we have to, we'll --  
14 after they have gone back and repaired that, then there  
15 will be a need for additional seed and fertilizer but  
16 it would be on a new surface, on additional material  
17 added.

18 THE COMMISSIONER: Well, I  
19 think we'll adjourn for coffee. Mr. Bayly, I take  
20 it you won't be much longer.

21 MR. BAYLY: No, sir.

22 THE COMMISSIONER: I'm sure Mr.  
23 Bell will not have any questions. I'm sure Mr.  
24 Goudge has only a very few and that will mean that  
25 maybe this afternoon we can move on to fish. So we'll  
26 adjourn for coffee.

27 (PROCEEDINGS ADJOURNED FOR A FEW MINUTES)  
28  
29  
30



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

Q Mr. Dabbs, when we were about to break, I was about to read to you a passage that I will be quoting here from Aldo Leopold's "Sand County Almanac" on "Wilderness for Science" which expressed I think the kinds of concerns that my clients have for the introduction of species that are not presently in the area, to the area as a scientific concern and perhaps you could respond to this passage by suggesting to me whether you agree that these are concerns, either which you have already dealt with in your studies or which you feel should be dealt with or shouldn't be dealt with. And it is at that volume on page 272 at the beginning of that chapter called, "Wilderness for Science". And it states, "That the most important characteristic of an organism is that capacity for internal self-renewal known as health. There are two organisms whose process of self-renewal had been subjected to human interference and control.

One of these is man himself, medicine and public health. The other is land, agriculture and conservation. The effort to control the health of land has not been very successful. It is now generally understood that when soil loses its fertility or washes away faster than it forms, and when water systems exhibit abnormal floods and shortages, the land is sick.

Other derangements are known as facts but are not yet thought of as symptoms of land sickness. The disappearance of plants and animal species



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

1  
2 without visible cause despite efforts to protect them  
3 and the eruption of others as pests, despite efforts  
4 to control them, must in the absence of simpler explana-  
5 tions be regarded as symptoms of sickness in the land  
6 organism.

7 Both are occurring too  
8 frequently to be dismissed as normal evolutionary events.  
9 The status of thought on these ailments of land is  
10 reflected in the fact that our treatments for them  
11 are still prevailingly local.

12 Thus, when a soil loses  
13 fertility we pore on fertilizer for at best alter its  
14 tame flora and fauna without considering the fact that  
15 its wild flora and fauna which built the soil to begin  
16 with may likewise be important to its maintenance.  
17 It was recently discovered, for example, that good  
18 tobacco crops depend for some unknown reason on the pre-  
19 <sup>of</sup>conditioning/the soil by wild rag weed.

20 It does not occur to us that  
21 such unexpected chains of dependency may have wide  
22 prevalence in nature. When prairie dogs, ground  
23 squirrels or mice increase to pest levels, we poison  
24 them but we do not look beyond the animals to find the  
25 cause of the eruption. We assume that animal troubles  
26 must have animal causes. The latest scientific  
27 evidence points to derangements of the plant community  
28 as the real seed on rodent eruption but few explorations  
29 of this clue are being made.

30 Many forest plantations are



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

1  
2 producing one log or two log trees on soil which  
3 originally grew three and four log trees. Why?  
4 Thinking foresters know that the cause probably lies  
5 not in the tree but in the microflora of the soil and  
6 that it may take more years to restore the soil floor  
7 than it took, to restore the soil floor than it took to  
8 destroy it."

9 Now, that is a dated piece.  
10 It is written in the 40's. It falls into the category  
11 which Dr. Banfield would call the broad brush or the  
12 dooms day outlook to things but it expresses a general  
13 concern and it is this kind of concern with which you  
14 as the head of the re-vegetation part of Arctic Gas's  
15 Environmental Project, went into re-vegetation with. Is  
16 this is one of the approaches you took.

17 MR. MARSHALL: Sir, I feel I must object.  
18 I am sorry I am being a bit of a nuisance this after-  
19 noon but if Mr. Bayly wants to get philosophy into  
20 evidence, surely he can call a witness to put that  
21 philosophy in.

22 Now, he has read a passage that  
23 has got a collection of all sorts of things in it, many  
24 of which, looking at the faces of the panel as the  
25 comments were being read, some of them might challenge  
26 or at least want to look at the authorities that support  
27 them and so on.

28 Now, to quote a very lengthy  
29 philosophical passage and then to ask any member of the  
30 panel a question based on that, when they haven't the



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

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thing in front of them, they haven't had an opportunity  
to look at it, seems to me is asking too much of them.

MR. BAYLY: Mr. Commissioner,  
may I respond to that?

THE COMMISSIONER: No, you  
don't have to respond. I think Mr. Marshall has  
characterized it properly. It is in a sense a philo-  
sophical attitude towards the environment but I see  
nothing wrong in asking Dr. Dabbs to comment on it.  
I would like to have Dr. Dabbs comments.

MR. BAYLY: Thank you sir.

THE COMMISSIONER: Ask him to  
say Leopold is right or he is wrong. Surely<sup>maybe</sup>/he will  
say that but I anticipate he might comment on it and  
that is as far as we can go.

MR. DABBS: I think I can make  
my answer shorter than the discussions~~of~~ objection by  
saying--

MR. MARSHALL: That's what we  
call progress sir.

THE COMMISSIONER: That is an  
attitude I have sought to encourage since March 3.

MR. DABBS: I really quite  
agree with everything that is read from Leopold's work.  
It is a classic and in our discussion two weeks ago  
when I was here on panel, two, in response to a question  
put to me by the Commissioner himself, I believe I started  
by indicating that we viewed that as a legitimate  
concern when we started our work. In the light of the



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

1  
2 evidence we have to date and thinking about it on a  
3 theoretical and practical basis, we have come to the  
4 conclusion that I have lead in evidence here and I  
5 think that is the extent of my comment.

6 Q All right. So, keeping  
7 that in mind as a philosophy that you have followed in  
8 your studies, you are not therefore concerned that  
9 introduction of these species from another area as  
10 pioneering species will disrupt the present system but  
11 will help to restore it, perhaps even more quickly than  
12 it would have been restored by using local pioneering  
13 species.

14 A Yes, sir. That is what I  
15 have been trying to say.

16 Q All right. Now, going on  
17 to another area which I believe is related to this.  
18 You are governed and we all are governed in matters of  
19 collection of and approval of seed by the Canada Seed  
20 Act and you referred in your evidence that certain  
21 species being recently approved under that act by, or  
22 actually under the regulations of that act and what I  
23 would like to ask you is whether you know if any  
24 of the native species you intend to use have already  
25 been approved under that act? You may not know that.

26 A For just a point of clari-  
27 fication, the Seed Act controls quite a range of things  
28 as you know, but what we propose to use as I identified  
29 in my prepared evidence, are two varieties sir, not  
30 species. The species involved are-- There are many



Banfield, Dabbs, Gunn, Hemstock  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

1

2

licensed varieties of those species.

3

Q I understand.

4

A The purpose of the Seed Act

5

and its associated regulations is to control the

6

genetic purity for the protection of everyone associated

7

with the agricultural trade to ensure a standard for

8

commerce, within the field of agriculture. It is not

9

the intent of the act to licence plant material for

10

any other reason and that is my understanding.

11

Consequently most of the plant

12

material in North America is clearly not licenced. It

13

is native.

14

Q Yes. It controls the sales

15

of certain varieties.

16

A That's all it is intended

17

for.

18

Q Yes. And so if you were

19

buying some of the varieties that you have suggested,

20

you would be spending a sum of money on in your evidence,

21

would some of these be native grass seeds, native that

22

is to the area north of the 60°N?

23

A Sir, I am not sure what you

24

are referring to in your question?

25

Q You have referred in your

26

evidence to having to spend some money on a quantity

27

of seeds through a seed broker.

28

A Yes, sir. Okay, I did.

29

The value of about something like half a million dollars.

30

Q Yes. And some of the seed



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Bayly.

1

2

that you will have to purchase, I believe, is species  
which are native to this area. Is that correct?

4

5

6

A The contracts referred to  
there are commercial varieties and the contract itself,  
well that is not what your asking.

7

Q So, your using--

8

9

10

A They are commercial varieties  
as we have discussed it here that are genetically  
related to natives, yes.

11

12

13

Q Yes. But if you were--  
So, your just talking about buying the commercial  
varieties through a seed broker?

14

A That's right.

15

16

17

18

19

Q But any other varieties  
that you would be using, would be ones that Arctic Gas  
or Northern Engineering would be growing or collecting  
for the purpose of mixing for the various plant com-  
munities where they are to be seeded?

20

A That's so, yes.

21

22

23

24

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Q Yes. Now, the one area that  
we did not discuss when I was asking about whether the  
pioneering species that you introduced might become the  
pioneering species in disturbed areas was in the area  
of fire. Can you express an opinion as to whether all  
or some of the pioneering species which you intend  
to introduce might well become the pioneering species  
in a fire area that was on or adjacent to or close to  
the pipeline right-of-way?



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Bayly

A They may form a minor  
component of the colonizing group.

Q All right. You haven't  
tested to see whether if you just spread them over  
a fire area whether they would generate?

A No.

MR. BAYLY: Those are all  
the questions I have. Thank you.

THE COMMISSIONER: Thank you  
Mr. Bayly.

CROSS-EXAMINATION BY MR. BELL:

MR. BELL: Q I have followed  
with interest the discussion about Canadian Arctic  
grass especially the colonizing variety. And, of  
course, the issue of succession is on everybody's lips  
these days. I would really like to jump in, up to  
my knees, but it appears that Mr. Bayly and Mr. Anthony  
have canvassed all of those aspects of the topic which  
are of interest to my client so I'll pass to Mr.  
Goudge.

CROSS-EXAMINATION BY MR. GOUDGE:

MR. GOUDGE: Q Sir, I'll  
be very brief. Mr. Dabbs, you adopted, I think, in  
your evidence in chief the impacts as recited in  
Volume 14DN of the application as being those impacts  
on vegetation that you see.

WITNESS DABBS: A Yes, sir.

Q Do you contemplate as  
well that there will be any impact due to the building



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Goudge

1 and operation of the line on vegetation off the right-  
2 of-way due to changes in drainages and moisture regime?

3 A That situation has been  
4 considered quite seriously. In fact, I think, perhaps  
5 many members of this panel were quite instrumental in  
6 pressing for Dr. Clark and his group to prove to us  
7 that they could, in fact, provide the drainage across  
8 the ditch to ensure that there would not be a signifi-  
9 cant alteration in moisture status down slope of  
10 the right-of-way and I therefore have concluded that,  
11 being assured by these people that they can design  
12 and provide for cross-ditch drainage, that there would  
13 not be significant change or significant impact of  
14 the vegetation.

15 Q And you're so satisfied.

16 A Yes, sir.

17 Q Moving to fire, Mr.

18 Dabbs, Mr. Hemstock describes that in his evidence in  
19 chief as being a destructive natural phenomenon. As  
20 a vegetation man, do you agree?

21 A As a plant ecologist,  
22 no, I don't.

23 Q How do you characterize  
24 fire?

25 A As a natural component  
26 of the landscape.

27 Q Do you agree that there  
28 will be an increase in the likely occurrence of fire  
29 due to the pipeline construction and operation?  
30



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Goudge

1  
2 A I really have no reason  
3 to believe that there would be an increase just because  
4 of the presence of the pipeline. Evidence however from  
5 fire studies say in the Yukon show that around commun-  
6 ities there is quite often an increase in the frequency  
7 of fires, so if there is an increase of population in  
8 communities I think it is reasonable to assume that  
9 because of human error.

10 Q That appears to be a  
11 rule of nature, doesn't it? That when the population  
12 increases in the north, fire risk increases?

13 A Yes, sir and that's--  
14 it would only be in the context that I would foresee  
15 an increase in fire frequency.

16 Q And you would assume that  
17 that rule of nature as I put it would apply in the  
18 case of the construction and operation of this line?

19 A Construction may not  
20 have that much to do with it but generally I would  
21 agree.

22 Q Has CAGSL developed any  
23 predictive device to indicate for us the increased  
24 risk due to the construction and operation of the  
25 pipeline?

26 A Not that I'm aware of.

27 Q Are you prepared to  
28 put any percentage on the increased risk?

29 A I don't myself foresee  
30 it as an increased risk and I could conclude that there



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Goudge

1  
2 may be an increased frequency but in terms of a risk  
3 I don't foresee it as an increase.

4 Q Are you aware of what  
5 contingency plans the applicant has got in process to  
6 deal with fires that may occur in the area of the  
7 pipeline?

8 A I couldn't say that  
9 I'm familiar with any contingency plans.

10 Q You have had nothing to  
11 do with the preparations of any plans that the  
12 applicant may have in that?

13 A It's not been my respon-  
14 sibility.

15 Q I see. And you have had  
16 no input, I take it into the development of those  
17 plans?

18 A If there are any plans  
19 that Mr. Hemstock could comment on in the input we  
20 might have or could have played in the evolution  
21 of those would simply be based on our study of fire  
22 and fire effects.

23 Q Mr. Hemstock, have you  
24 had any participation in the development of the  
25 contingency plan to deal with fires in the area of the  
26 pipeline?

27 WITNESS HEMSTOCK: A No,  
28 sir, other than the general comments which we have in  
29 the application that the routine inspection <sup>of the pipeline</sup> will aid  
30 in the earlier detection of the fires and I think



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Goudge

historically that earlier detection and the availability  
of the material and people to fight fires has resulted  
in smaller acreages being burned.

We have also said that  
we would provide, where useful, men and equipment to  
help in the control of fires along the general corri-  
dor.

Q Let me ask you this. You  
are aware of the applicant's proposal to burn brush  
on the right-of-way after clearing?

A Yes, sir.

Q And you are aware that  
that burning may result or would you acknowledge that  
it may result in fire getting down into the organic  
mat and overwintering so to speak to spring up the  
following year. Is that a risk?

A I suppose it's a risk.  
I would put it at quite a small risk because we've  
said we would intend to burn it over the pipeline  
ditch or the area which is going to be the ditch and  
I would think that the subsequent ditching process,  
the backfilling, construction of snow roads over the  
area and so on would pretty well take care of any  
concern in that area but there is a possibility that  
the organic material might harbor a fire for a long  
time.

Q And wouldn't it be  
desirable to develop a special surveillance the  
following spring to take account of that risk?



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Goudge

1 A Well, that kind of  
2 surveillance is provided by the regular routine  
3 pipeline surveillance which will be provided.

4 Q You are satisfied that  
5 a fly-over surveillance would be sufficient?

6 A Yes, sir.

7 Q Would you ever contemplate  
8 that there may be a need during the summer, insofar as  
9 summer operations would be a part of the construction  
10 program, to cease work because of high-fire risk?

11 A I think it's not very  
12 likely, we would be confining the work in summer to  
13 a pad and compressor staging sites and so on. And  
14 I would think the chance of there being an impact from  
15 that would be quite slight.

16 Q There is no doubt however  
17 that north of sixty, particularly in the valley is an  
18 area which can get very dry and very fire prone in  
19 the summer?

20 A That's right, yes.

21 Q And if that were the case,  
22 you would be able to foresee that eventual ity. Perhaps  
23 only rarely but it may occur.

24 A It may occur, yes.

25 Q Now, finally, Mr. Dabbs,  
26 you dealt with Mr. Anthony this morning about snow  
27 roads and as I understood you, you acknowledged the  
28 need to develop some criterion for getting off a snow  
29 road at the end of the winter construction season to  
30 avoid vegetation damage?



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Goudge

WITNESS DABBS: A I

think we actually in Mr. Hemstock's discussion established the one and only criteria.

Q Yes, Mr. Hemstock said he was satisfied with the criterion that had ensured no breakthrough of the pavement, as he called it. Would that satisfy you?

A Yes.

Q I take it you're no longer concerned about damage due to simply to compaction under the snow road?

A No, if the snow road is built "properly". In other words, if there is sufficient penetration of frost in the fall and early winter then compaction would not be a problem.

Q If there is compaction you stick by your answer of this morning, that if compaction becomes significant, vegetative damage occurs?

A If it were to take place then, yes.

Q Yes. So that both of you, I take it, and I'll ask both of you to answer would be satisfied with the criterion that got the spread off the snow road in such a way that there was no breakthrough of the snow road paving. Mr. Hemstock, would you be satisfied with that?



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Goudge

WITNESS HEMSTOCK: Yes.

WITNESS DABBS: Yes, I would  
too.

Q Do you have any sugges-  
tions for us, or any help for us as to measuring  
tools that might be used to ensure that?

WITNESS HEMSTOCK: No, I  
think that the method to ensure protection is regular  
inspection by people on the right-of-way and I just  
don't think that there is any instrument that can do  
a better job than a person there looking at what's  
going on.

Q Provided that he can  
make a prediction which will allow the spread to get  
off before breaking through the pavement.

A Yes, and we would expect  
to have at least some warning on that because you--  
when you see the pavement softening, and some chance  
of breakthrough, first indications of breakthrough,  
then the operations would have to be carried on during  
the evening or the night periods when you do get some  
frost and clear it out in time, and normally you have  
enough warning to take care of that demobilization.

Q Then lastly, in answer  
to Mr. Bayly, I think, Mr. Dabbs, you were talking  
about the leaving of merchantable timber on the right-  
of-way to be available on a priority basis for  
communities. Is there a risk that that merchantable  
timber will go unused, resulting in rot and accompany-  
ing problems?



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Goudge  
Cross-Exam by Gibbs

1 WITNESS DABBS: I suppose there  
2 is a risk in very remote areas, very remote river  
3 flood plains.

4 Q You would agree with me  
5 that if it does go unused and does rot, it causes  
6 problems,

7 A I could agree with you  
8 if you could identify the problems perhaps.

9 Q Well, do you agree that  
10 there are problems, or is it just a simple assertion  
11 that there are no problems caused by the rotting of  
12 merchantable timber?

13 A It's a matter of  
14 quantity, I suppose. If it happened to be a large  
15 quantity left to dry and rot, that in itself is  
16 perhaps a source for fuel for fire. I think there is  
17 a remote chance that it could harbour disease.

18 Q In order to avoid that  
19 would it not be preferable to transport the merchant-  
20 able timber to where it would be used?

21 A To avoid it, I suppose  
22 that would be preferable, yes.

23 MR. GOUDGE: Those are all the  
24 questions I have. Thank you, sir.

25 MR. MARSHALL: I'm bringing  
26 him back specially. No, I expect the re-direct, if  
27 any, Mr. Gibbs, would wait till the end of cross-  
28 examination of the panel.

29  
30 CROSS-EXAMINATION BY MR. GIBBS:



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

1 Q Mr. Hemstock, would you  
2 turn to page 2 of your prepared evidence?

3 WITNESS HEMSTOCK: Yes sir.

4 Q And I direct your atten-  
5 tion to the last paragraph and the last couple of lines  
6 and ask whether "the continuing monitoring support of  
7 the Board" is still continued by Canadian Arctic Gas.

8 A Yes sir.

9 Q On the same scale as it  
10 has been in the past?

11 A Not on the same scale in  
12 terms of total dollars per year. We have provided a  
13 budget to the Environmental Protection Board this year  
14 for the continuation of their meetings and for their  
15 attendance to hearings.

16 Q Would you turn to page  
17 4, please? And in respect to the last sentence of the  
18 first paragraph you, I take it, will confirm that the  
19 coastal route now includes the cross-delta route?

20 A My information is that  
21 the company has indicated to the National Energy Board  
22 that they will be filing the cross-delta as a prime  
23 route within the next several days, or perhaps weeks,  
24 and at that time it will then be the prime route.

25 Q Well, your information is  
26 a little out of date, Mr. Hemstock. I was there when  
27 Mr. Goldie announced that the company had adopted, now  
28 formally adopted the cross-delta route as the delta  
29 end of the prime route, and you're satisfied with my  
30 informing you of that, that takes a little bit more



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
CROSS-Exam by Gibbs

1 recent than your information that they anticipated  
2 doing so?

3 A Yes.

4 THE COMMISSIONER: Maybe the  
5 mail being held up accounts for the surprise.

6 MR. GIBBS: Mr. Marshall  
7 gets to use the telephone.

8 Q And will you look at  
9 paragraph 3 on page 4 and confirm for the record that  
10 the \$12 million environmental program to the end of  
11 1974 was paid for by the Canadian Arctic Gas sponsors  
12 on equal shares and one of those was the Alberta Gas  
13 Trunk Line Company.

14 A That's my understanding.

15 Q Now, will you turn over  
16 to page 5 and the first full paragraph after the  
17 paragraph numbered four where you speak of monitoring  
18 the pipeline from engineering or operating standpoint  
19 will also provide the facility for the monitoring of  
20 the environmental impact along the route. There are  
21 you intending to speak of monitoring during the  
22 operations and maintenance phase?

23 A Yes sir.

24 Q How will the monitoring  
25 be done, Mr. Hemstock? Walking, by flying, by some  
26 wheeled vehicle?

27 A I would expect that the  
28 major part of the monitoring will be with the routine  
29 flights over the pipeline right-of-way, where an  
30 experienced biologist would accompany the people who



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

1 inspect the right-of-way for engineering reasons, and  
2 I would expect that it would also be added to by  
3 specific investigations of perhaps particular sites  
4 that were of concern.

5 Q You expect your monitoring  
6 party to consist of, at the least, of an engineer and  
7 a biologist.

8 A That sort of thing, yes.

9 Q How frequent will that  
10 monitoring occur?

11 A I believe the application  
12 has said one to three flights per month.

13 Q And --

14 A Sorry, I can't remember  
15 the exact number of flights, but it is in the applic-  
16 ation.

17 Q -- I believe it was in  
18 your evidence of one to three times a month.

19 A I think that's correct,  
20 yes.

21 Q And it's your evidence,  
22 Mr. Hemstock, that a biologist in an airplane going  
23 one to three times a month will be able to spot any  
24 environmental damage that might occur along the right-  
25 of-way?

26 A I think in general that's  
27 correct. I would foresee that there might be some  
28 special cases, for instance the monitoring of  
29 particular populations might be done on a more  
30 regular basis. For instance, the arrival of say the



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

1 calving -- the caribou into the calving grounds would  
2 be something that we would want to watch quite care-  
3 fully.

4 Q Tell me what height the  
5 monitoring aircraft will fly at.

6 A Again, as I understand it,  
7 the flights are normally quite low level, in the order  
8 perhaps of 150 feet above ground, and we would be  
9 controlling those flights with respect to environme ntal  
10 concerns,at specific times of year. Dr. Gunn, for  
11 instance, would advise that there may well be certain  
12 times where we would be required to fly at higher  
13 elevations.

14 Q I take it you're prepared,  
15 Mr. Hemstock, to acknowledge that it's going to be  
16 pretty difficult for a biologist at 150 feet in an  
17 airplane to spot any particular damage to the revegeta-  
18 tion program that Mr. Dabbs has instituted?

19 A Well, Mr. Dabbs could  
20 certainly reply to that. It would be my feeling that  
21 the erosion and the bare areas would be quite visible  
22 from an aircraft. Perhaps Mr. Dabbs could comment.

23 WITNESS DABBS: I believe I've  
24 suggested that the combination of visual inspection  
25 and those areas where there is potential for loss  
26 of plant cover from erosion or other causes to be  
27 monitored with the idium scale of color and color  
28 infra red photography to supplement a visual inspection.  
29 That would very accurately illuminate those areas.

30 Q All right. Dr. McCart,



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

1 would you turn to page 20 of your evidence? The first  
2 full paragraph after paragraph No. 3 at the end of the  
3 paragraph you say:

4 "We will continue to add to our list as new  
5 information becomes available."

6 And your list is a list of potential critical areas.  
7 What kinds of information do you expect to receive  
8 which will assist you in adding to your list of poten-  
9 tial critical areas?

10 WITNESS McCART: Well, there  
11 are a large number of agencies working in the area  
12 and as information becomes available we, as I pointed  
13 out, I think in my evidence in panel 2, have prepared  
14 this stream catalogue as a loose-leaf so that we can  
15 add information, that we can rate either ourselves or  
16 information that other people generate, concerning fish  
17 populations.



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

1 Q My question is, what  
2 kinds of information do you expect to have to enable  
3 you to add to your list of critical areas?

4 A I thought I'd answered  
5 that question. What kinds of information?

6 Q Yes.

7 A Or what kinds of areas?

8 Q Beg your pardon?

9 A Spawning and overwintering  
10 areas of fish primarily.

11 Q Will you turn to page  
12 21, please, towards the end of the first full paragraph  
13 is this sentence:

14 "Arctic fish populations are resilient, however  
15 and even Arctic char populations are unlikely  
16 to suffer permanent damage as long as sedimenta-  
17 tion is short-term."

18 Could you define for me your understanding or your  
19 intention in that sentence, of the meaning of the word  
20 "resilient"?

21 A Arctic populations in  
22 general are adapted to a rather variable environment,  
23 in that they are unlikely to be -- the populations are  
24 unlikely to be destroyed or markedly reduced, the  
25 size of the population, in the face of a short-term  
26 perturbation such as an increase in sedimentation or  
27 something of this nature, unless it is so catastrophic  
28 that the population is entirely decimated.

29 Q Well by "resilient"  
30 do you mean that if a spawning ground is made unusable



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

1 they are adaptable enough to select another one?

2 A Well, probably not because  
3 of course I think that these areas that they use as  
4 spawning grounds are in fact circumscribed, they are  
5 used traditionally, they are areas in which open  
6 spring water or ground water are available, are rather  
7 circumscribed.

8 Q Then by "resilient" do  
9 you intend to convey that if you lost of a fish popula-  
10 tion in a particular river, a year's egg spawn, that  
11 that would not seriously affect the fish population?

12 A I would think that they  
13 are probably capable of withstanding this kind of  
14 insult, yes.

15 Q And with respect to  
16 Arctic char, would you intend the word "resilient" also  
17 to convey that if those fish which would have spawned  
18 were lost through some action in the stream that that  
19 would not seriously affect the fish population?

20 A Well, that would have a  
21 much more serious effect because you would be affecting  
22 a large number of year classes, because of course  
23 spawning population is made up of a number of year classes

24 Q But if it were only a  
25 one-year loss you would expect over a period of years  
26 for that to be restored?

27 A The loss of a single  
28 year class, yes, I would.

29 Q And is that one of the  
30 intentions you had in using the word "resilient"?



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

1 A Yes.

2 Q And you speak in the  
3 same sentence of permanent damage and I heard you  
4 previously talk of damage to eggs and spawning fish,  
5 but I've been wondering about damage to the food supply,  
6 whether these type of sedimentation concerns could also  
7 be a concern because of possible damage to the Arctic  
8 char food supply.

9 A Certainly, we've gone  
10 through this in considerable detail in Volume 15,  
11 and it's also included in the application, discussion  
12 of exactly these problems.

13 Q And that again, if there  
14 were sedimentation damage to the food supply again,  
15 you could reduce the population in any particular  
16 stream by -- because of that.

17 A If in fact you did  
18 reduce the food supply, you would have an effect on the  
19 population, yes. However, I should point out I don't  
20 think this is likely to occur, in any of the areas  
21 where the pipeline passes in the vicinity of Arctic  
22 char populations within the Yukon Territory.

23 Q Will you turn to page  
24 23, please, and I direct your attention to the paragraph  
25 about berm construction in the Mackenzie River at  
26 Swimming Point, and the Great Bear River, and from  
27 the Great Bear River, and I take it, Dr. McCart, that  
28 you believe that the impact on fish from the berm  
29 construction in each of those rivers can be kept to a  
30 fairly harmless minimum.



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

A Yes.

Q And that in reaching that viewpoint you gave consideration to all of the aspects of construction of the berm and how long it would be in place and the activities that would take place upon it.

A Well, in this particular instance I think I'm speaking only of the velocity changes.

Q But in order to speak of velocity changes, you would surely have to know something about the construction of the berm.

A Yes.

Q And in the case of each of those rivers, the Mackenzie at Swimming Point and Great Bear River, can you tell me how long the respective berms are expected to be?

A I discussed this with Mr. Williams, I think, several weeks ago, and my understanding is that they would be placed -- they would be put in place as the spring flood was subsiding and would remain in place until sometime during the course of the winter.

Q Sorry to interrupt you. I didn't mean length in the sense of time, but length in the sense of distance.

A I have seen plans for both of these, and I can't recall what it is but I suspect something like 50%, for instance, of the Great Bear River, and as far as the other location goes,



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

1 most of the berms are actually in a very shallow area  
2 and it's not, does not impinge on the main channel  
3 bed.

4 Q Well, the fact is that  
5 the berm in the Mackenzie River at Swimming Point  
6 is intended to be some 1,400 feet long, is it not?

7 A I'm not certain of the  
8 length. But as I say, most of it is in very shallow  
9 water.

10 Q I'm coming to the  
11 depth of the water, but I think your own reference  
12 in response to question 44 of the Pipeline Assessment  
13 Group tells us that it's going to be 1,400 feet long.  
14 It's at page 44-1 of Exhibit 70, and do you see that  
15 reference to Swimming Point, length of berm, 1,400 feet?

16 A Yes.

17 Q And the length of the  
18 berm at the Great Bear River, 400 feet.

19 A Yes.

20 Q And in each case that's  
21 approximately one-third of the way across the river.  
22 Is that correct?

23 A I don't know the distances  
24 across these streams.

25 Q Well, I wonder, Dr.  
26 McCart, how you can talk about velocity if you don't  
27 know how far across the river the berm is going to  
28 reach?

29 A I didn't make the  
30 velocity calculations. They were made by a hydrologist.



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

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Q I understood you to say  
that your main concern in these berms was the increase  
in water velocity, in fact you say that the former,  
in that same paragraph, speaking of the berm construction  
on the Mackenzie River:

"The former would result in only slight  
increases in water velocity,"  
but you have no personal knowledge of that.

A Well, I discussed this  
with people who made the calculations, sir.

Q Yes sir, but you have  
no personal knowledge of the difference in water  
velocity which will result by the berm construction in  
the Mackenzie River at Swimming Point.

A Well in the sense that  
I didn't make the calculations.

Q Well, in that sense you  
have no personal knowledge of it.

A Yes.

Q All right, we're going to  
come to what you do know about it in a few minutes.  
Do you know how wide these berms are intended to be?

A No.

Q Beg pardon?

A No.

Q Well, if you look at your  
reference to the response to question 44 to the  
Pipeline Assessment Group, you will find in the second  
full paragraph you state:



Banfield, Dabbs, Gunn  
Hamstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

1 "It is expected that the berms will be about  
2 80 feet wide."

3 Do you see that?

4 A Well, in fact I didn't  
5 write this response, incidentally.

6 Q Well now, sir, but in  
7 this paragraph you tell us all to look to question 44  
8 of the Pipeline Assessment Group response, and I  
9 presumed that you knew what was in their response  
10 to that question.

11 A With respect to velocity  
12 increases, yes, I did.

13 Q Now sir, can you tell me  
14 what the average depth of water will be along the berm  
15 across the Mackenzie River at Swimming Point?

16 A No, although as I say,  
17 I discussed this with Mr. Williams and it is in the  
18 shallow portion.

19 Q Well, if you can't tell  
20 me what the depth of water is, I wonder how you can  
21 say that culverting through the berm may assist in the  
22 fish problem.

23 A I think that the reference  
24 in my testimony is to culverting at a berm at Great  
25 Bear River --

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Banfield, Dabbs, Gunn, Hemstock  
Jakimchuk, McCart.  
Cross-Exam by Gibbs.

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Q Well, then can you tell  
me the average depth of the water along the berm on the  
Great Bear River?

A I don't know.

Q Well, again you have no  
basis upon which to put forward the idea that culverting  
will help in the fish problem?

A Well, in a sense that I  
was assured by the hydrologists that culverting would  
reduce the velocity in the free area at the end of the  
berm and anything that assists in reducing the velocity  
is going to be an aid in fish migration.

As I say, my testimony refers  
only to velocity.

Q Can you tell us sir at what  
time of year the berms will be constructed?

A As I say, my understanding  
is, and it may not be correct, is that they will be  
constructed during the, after the secession of the  
spring flood.

Q And can you tell me how  
long the berms will remain in the river before they are  
either cleared away or eroded away?

A I am not certain, but I  
have a vague recollection. It is approximately eight  
months or something in that nature.

Q Would that eight month  
period then cover the spawning time of whatever fish  
spawn, go up those rivers to spawn?



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Gibbs.

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A It would, yes.

3

Q Can you relate the mode

4

of construction of the berms? That is to say are they

5

purely earth fill, like an earth dam or will they be

6

concrete or what construction techniques?

7

A My understanding is that

8

they will be constructed by in-dumping off of materials.

9

Q Just by dumping fill in and

10

piling it up and piling it up until you have got a

11

high enough pile, eighty feet wide?

12

A Yes.

13

Q And I take it you agree that

14

that process is going to allow quite a lot of sedimentation

15

to go down river in the water?

16

A Yes, it would.

17

Q Dr. McCart, can you tell

18

me the purpose for which the berms are being constructed?

19

A To assist in constructing

20

crossing of these channels.

21

Q Do you know how they assist

22

in crossing these channels?

23

A No.

24

Q And you propose, Dr. McCart,

25

that culverts be put through the berms to avoid any

26

problems of the fish migrating upstream?

27

A As I say we pointed out

28

that this is a problem. My testimony is concerned only

29

with the velocity at the end of the berm. As I say, we

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pointed this out that this was a problem, it was suggested



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Gibbs.

1  
2 to us that one of the ways that the velocity could  
3 be dissipated is by passing a certain proportion of the  
4 water through the berm using culverts.

5 Q And has your suggestion to  
6 use culverts been adopted?

7 A I don't know whether it is  
8 incorporated in the most recent designs or whether in  
9 fact there is a final design for these crossings.

10 Q I wasn't intending to go  
11 that far. I was wondering whether you had any in-  
12 formation or acknowledgement from Arctic Gas that they  
13 were going to or had adopted your proposal to put cul-  
14 verts in the berms?

15 A My discussions were with  
16 the engineers and hydrologists at Northern Engineering.  
17 I should point out that it was not my suggestion that  
18 culverts be incorporated. It was their suggestion that  
19 this was one way in which velocity problems or velocity  
20 could be dissipated.

21 Q And do you agree that the  
22 use of culverting through the berm might accomplish that  
23 purpose?

24 A Well certainly it would  
25 reduce the amount of flow around the end of the berm.

26 Q And you believe it would  
27 assist in the fish migrating upstream?

28 A If it reduces the velocity.

29 Q And do you believe that the  
30 use of culverts will reduce the velocity?



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Gibbs.

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it will, yes.

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Q Have you conducted any independent investigation or observation to assure yourself that that will happen? That the installation of culverts will reduce the velocity?

8

9

10

A No, I must say I have to depend on the advise of hydrologists and river engineers.

11

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13

14

Q Have you any experience Dr. McCart in this type of situation where a culvert is put into a stream through a berm or a dam or something of that sort?

15

16

17

A Well, most of my experience has been in studies of culverts through roadways, not through berms or dams.

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Q When you speak of reducing the velocity, I take it, that it is your view that in building the berm you will increase the velocity in that area of the river which is not occupied by the berm?

23

24

A Yes, that is what the calculations in question 44 certainly show.

25

26

27

28

Q And in order to, and your-- would you suggest putting in the culverts to let some of the water through so that that would cause a reduction in the velocity around the end of the berm?

29

30

A That's a suggestion that was made by the hydrologists as a method of reducing



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Gibbs.

1  
2 velocity, yes.

3 Q What velocities do you  
4 expect the water to reach during the upstream migration  
5 period around the end of the berm in the Mackenzie  
6 River at Swimming Point?

7 A The indication is here that  
8 there will be negligible increase in velocity.

9 Q No, I didn't ask you  
10 increase. I said what velocity did you expect the water  
11 to reach?

12 A Well the indication is that  
13 it would be just over six feet per second, mean cross-  
14 sectional velocity.

15 Q And that would not be an  
16 increase over the normal river velocity? Is that what  
17 your telling me?

18 A Well, I think that it is  
19 indicated in the table, yes. That there would not be  
20 an increase over the normal/<sup>river</sup>velocity here, at least  
21 a negligible one.

22 Q Well, doesn't that defy  
23 simple country logic that if you close the river off  
24 to half its width, that you going to gain water velocity?

25 A If you in fact look at the  
26 configuration of the berm, in particular the one at  
27 Swimming Point, that much of the area in which the berm  
28 is going to be constructed is in fact either extremely  
29 shallow water or a foot or two in depth or at low water  
30 stages, in the lighter part of the summer when migrations



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Gibbs.

1  
2 are occurring, it may in fact be dry over much of the  
3 length of this 1400 foot berm.

4 Q So, then there -- adopting  
5 that response Dr. McCart, there is no problem with the  
6 berm constriction on the Mackenzie River on fish?

7 A Not as far as velocity goes,  
8 no.

9 Q All right. Is there in the  
10 Great Bear River?

11 A As I have indicated there  
12 may some increase. There probably will be, undoubtedly  
13 an increase there because you are in fact constricting  
14 the flow to a considerable extent. There will an  
15 increase in velocity and there is a possibility that  
16 in those circumstances, unless you take care to provide  
17 areas where fish can rest as they are moving upstream,  
18 that certain smaller fish might be impeded in their  
19 upstream migration.

20 Q And at the Great Bear River  
21 would you expect to use culverts to reduce the velocity?

22 A At the Great Bear River  
23 where it was suggested to me, we have not suggested that  
24 there be culverts in the berm at Swimming Point, only  
25 at the Great Bear River.

26 Q And when you suggested to  
27 the hydrologist or to the engineer or combination of  
28 both that culverts be installed--?

29 A I didn't suggest that culverts  
30 be installed. I suggested that there may be a problem



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Gibbs.

1  
2 with increases in velocity and they, in fact, suggested  
3 that this is one way in which the velocity might be  
4 reduced at the end of the berm or in the unbermed  
5 portion of the stream.

6 Q The Arctic Gas engineers  
7 suggested this?

8 A The Northern Engineering  
9 hydrologists with whom I spoke.

10 Q Was any indication given to  
11 you of the composition of the culverts that might be  
12 used?

13 A No. I don't think we have  
14 progressed to that stage.

15 Q Well, the idea of the cul-  
16 verts puzzled me somewhat because I understood from  
17 your Volume, Exhibit 55, Construction Plan, that once the  
18 berm had been built, the plan was to excavate the ditch  
19 right through the berm and I wondered what was going to  
20 happen to the culverts when the ditching machine got  
21 down that far and I wonder therefore if that is the  
22 plan the thought of putting in culverts really is a  
23 serious suggestion?

24 A It may not be if that's so.

25 Q And if that is so and I can  
26 give you the reference in the filing Dr. McCart, then  
27 you are not going to be able to relieve the velocity  
28 by culvert use, so you are left with the increase coming  
29 around the end of the berm and that will be a substantially  
30 higher velocity and feet per second than it would be



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Gibbs.

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without the berm in place?

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Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Gibbs

A Well, it's a maximum of  
22%, 18% as I say at extreme high water -- 22 at  
moderate and typical discharges.

Q And that is an increase  
to about 5 to 6 feet per second?

A Yes. No.

Q I beg your pardon.

A It is an increase to  
5 or 6, not an increase of 5 or 6.6.

Q To 5 or 6 feet per second.

A Yes.

Q And 5 or 6 feet per  
second is a higher velocity than the fish who normally  
migrate upstream in that river can overcome. Is it  
not?

A No. That's not so. The  
difficulty is that 5 or 6 feet per second would impede  
fish which had to pass through a culvert if it were a  
pipe culvert and in which there were no areas available  
for them to rest, behind rocks or behind structures  
which were incorporated into the culvert or something  
of this sort. Under those circumstances, fish would  
have extreme difficulty passing through a culvert.

However, in a natural  
streambed and half of the stream will be maintained in  
its natural state. There are rocks on the bottom.  
There are eddies behind these in which there is  
essentially no flow at all.

We are talking about



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Gibbs

1 mean cross-sectional velocities and fish normally do  
2 not migrate upstream against mean cross-sectional  
3 velocities. They take advantage of eddies behind  
4 rocks. They take advantage of pools along the back-  
5 waters along the edges of the stream. Those options  
6 will still be available to them.

7 Q So then the increase in  
8 velocity is no problem either then?

9 A I see the increase in  
10 velocity as not being a problem at Swimming Point  
11 certainly because we have been told that it will be  
12 negligible. It may be a problem at the Great Bear  
13 River except that we have <sup>to be</sup> assured that the bottom  
14 contours or the natural materials in the bottom and  
15 along shore are maintained so they have these options.

16 Q You have been assured  
17 that that is the case?

18 A Well, it's very difficult  
19 to see how they could smooth out the bottom of the  
20 river for any distance so that they don't have these  
21 options.

22 Q Well, I guess I have  
23 misunderstood the whole sense of the paragraph, Dr.  
24 McCart. I thought you were telling us that you were  
25 concerned about the damage to fish because of the  
26 increase in water velocity and you have told me about  
27 that in the Great Bear River but now, I guess you are  
28 telling me that there is no real concern about the  
29 increase  
/in water velocity.

30 A What I pointed out, I



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Gibbs

1 think, in my paragraph is that we were in fact  
2 concerned about the constriction resulting from the  
3 berms so these calculations were made to indicate to  
4 us what we could expect in the way of increases.  
5

6 And that looking at  
7 the increase in velocity which are indicated in the  
8 response to question number 44, if in fact the bottom  
9 contour or the natural bottom substrate is maintained  
10 and <sup>if</sup> there is no disruption in the flow along the  
11 bank, the north bank of the Great Bear River, I don't  
12 see that this is going to be a very serious problem  
13 for fish moving upstream, no.

14 Q But is there not this  
15 problem? You don't think there is going to be a  
16 problem with the water velocity so I'll put that to  
17 one side but is there not this problem? That is,  
18 that with a berm constructed by just dumping loose  
19 material over the edge, you're going to have sedimen-  
20 tation, siltation and you're going to have erosion  
21 that's going to keep that water murky for your eight  
22 months of while it's there and beyond that?

23 A Yes, there will be  
24 a sedimentation problem.

25 Q And isn't that a  
26 potential danger to the fish?

27 A It's a potential danger  
28 except that we have been unable to obtain any data  
29 which would indicate that there are fish spawning  
30 downstream of that bermed area in the Great Bear River.



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Gibbs

1 Q So, you now are able  
2 to assure us that there is no problem either from the  
3 erosion of the berm or the siltation that will be  
4 carried on.

5 A No, I don't think I would  
6 want to assure you. I think we want to look at that  
7 area. That's an area in which we want to do further  
8 investigation in the future.

9 Q And then, Dr. McCart,  
10 do I understand the further investigation for the  
11 Great Bear River at least will be what is likely to  
12 happen as a consequence of the berm in terms of water  
13 quality, firstly. Is that correct?

14 A I think our primary  
15 interest would be in determining whether <sup>there are</sup> fish populations  
16 downstream. I think that the -- well, I know that the  
17 Fishery Service has carried out several years of work  
18 on the Great Bear River and there is no hard data indi-  
19 cating that that particular area is used for spawning  
20 or is in anyway critical to fish populations.

21 Q Isn't there still another  
22 concern that if you get a berm 1400 feet long at  
23 Swimming Point, 80 feet wide and some depth that you're  
24 not sure of, even if it's only 4 feet that you have  
25 a vast quantity of non-compacted material which is  
26 going to be carried down river?

27 A I think there is certainly  
28 going to be sedimentation occurring from the berm, if  
29 that's what you're asking.

30 Q And do you foresee a



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Gibbs

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25 a vast quantity of non-compacted material which is  
26 going to be carried down river?

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28 going to be sedimentation occurring from the berm, if  
29 that's what you're asking.

30 Q And do you foresee a



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Gibbs

1  
2 problem of the river water carrying that material and  
3 depositing it in a place which will be harmful to fish?

4 A There's a possibility.

5 Q And is that a possibility  
6 that's going also to be investigated?

7 A We are, in fact, carrying  
8 out studies in that area, yes, in the channel, in the  
9 vicinity of Swimming Point. I should point out,  
10 incidentally that now that the prime route is the cross-  
11 channel route that it's unlikely that the, it's likely  
12 that the crossing will be moved further upstream.

13 It will not be in the  
14 vicinity of Swimming Point.

15 Q Why would you move it  
16 upstream if the berm is not going to be a problem  
17 anyway?

18 A Simply because it  
19 shortens the route. If you're going to go the cross-  
20 channel rather than the other route obviously you've  
21 got to reroute certain segments there as well.

22 Q Well, I take it, Dr.  
23 McCart, that in due course --

24 A Incidentally, let me  
25 go back again. I have said that I do not think that  
26 it will be a problem in terms of water velocity, that  
27 is the intent of my, the information I have included  
28 here. In my testimony.

29 Q Well, I take it that in  
30 due course, there is going to be something forthcoming



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Gibbs

1  
2 as a result of investigations, if not for the  
3 Mackenzie River because it's going to be moved but  
4 for the Great Bear River, some further investi-  
5 gation of the effect of velocity on the fish. Is that  
6 correct?

7 A I don't think that we  
8 have to do further investigation on the effects of  
9 velocity on fish.

10 Q Some further investigation  
11 on the effect of the siltation or sedimentation which  
12 will result from the erosion of the berm.

13 A Well, what I think we  
14 have to find out is whether there are in fact any  
15 critical areas downstream. As I say, several years  
16 have been spent in the area. There is a report which  
17 will be available in the future from the fisheries  
18 service and there is no indication that particular  
19 area downstream is critical in any way.

20 Q And are you going to  
21 double check this fisheries report service?

22 A Yes.

23 Q And so that's going to  
24 be forthcoming?

25 A Yes.

26 Q And if you find no fish  
27 populations downstream, then your conclusion will be  
28 that it doesn't matter whether the berm goes across  
29 one-third or three-quarters because it won't hurt  
30 anything anyway.



Dabbs, Hemstock, McCart, Gunn,  
Jakimchuk, Banfield  
Cross-Exam by Gibbs

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A I think we would be  
concerned that the final design incorporate methods  
or incorporate mitigative measures to ensure that  
sedimentation from this source is kept to a minimum  
whether there are fish there or not.



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

1 Whether we can demonstrate that there are fish there  
2 or not.

3 Q When you say:

4 "No significant fish populations downstream..."

5 A No, I didn't say that.  
6 I said that there are no data to indicate that there  
7 are.

8 Q Yes.

9 A It's possible.

10 Q But nonetheless , there  
11 are significant migrations up those rivers for  
12 spawning purposes.

13 A Yes. I'd be more  
14 concerned about the migrations for overwintering  
15 purposes. This is one of the major spawning -- or  
16 sorry, overwintering areas for grayling.

17 Q Up beyond where the berms  
18 are going to be constructed?

19 A Yes.

20 Q And do you see the berms  
21 constituting a barrier to the upstream migration for  
22 overwintering purposes?

23 A No.

24 Q The fish will pass as  
25 freely and as easily as if there were no berms there  
26 at all?

27 A I think that certainly  
28 the adult fish, the adult grayling and the larger  
29 juveniles will have no difficulty, There may be some  
30 additional effort required on the basis of small fish.



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

1 But small fish even as small as an inch or so are  
2 capable of moving upstream quite easily through streams  
3 where there is a mean cross-section of velocity at  
4 least equivalent to 6.6 and probably larger. The  
5 sockeye salmon fry, millions of them are spawned down-  
6 stream of lakes, Babine Lake, Babine River system,  
7 for instance, these things move upstream as soon as  
8 they emerge from the gravel within a few days of  
9 emergence at a size of possibly three-quarters of an  
10 inch, and are able to move up many miles in streams which  
11 flow at approximately the same velocity as the Great  
12 . Bear River.

13 Q I understood, sir, that  
14 the type of fish which are going -- which normally use  
15 these waters might have problems overcoming velocities  
16 of four feet per second. Would that be correct?

17 A Velocities, 4 feet per  
18 second, if they are unable to rest, yes. In other  
19 words, they have to have an area in which they can  
20 rest, and therefore by maintaining the natural  
21 stream bottom they have these areas for fish which  
22 are the young of the year, they may rest every two  
23 inches or so, and are quite capable of doing this and  
24 normally do it. If they had to pass through a culvert  
25 in which there were no resting areas, no eddys, no  
26 places that are of low  
26 /velocity they wouldn't be able to do it under any  
27 circumstances. But if you maintain the normal stream  
28 bottom, and you maintain at least one bank up which  
29 they can migrate, moving to back eddys and things of  
30 this sort, I don't expect that they will have any



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

1 great difficulty, even relatively small ones.

2 Q Would you now turn, Dr.  
3 McCart, to page 29 and there you endorse an opinion  
4 that  
5 expressed by Dr. N.J. Wilimovsky, /with specific reference  
6 to fish an oil pipeline would be three to five times,  
7 and a road six to ten times more dangerous than a gas  
8 pipeline, and I wonder if you would tell me why?

9 A Well, I think that --  
10 I think primarily I'd be concerned about the oil spill  
11 problem, that the major medium for the transport of  
12 oil under these conditions is through water and that  
13 if a gas leak were to occur, that the effects would  
14 be very, very localized; whereas if a comparable spill  
15 of oil were to occur, this material might be carried  
16 a considerable distance and have much greater effects.

17 Q I understood. I didn't  
18 appreciate from this statement that it was in terms of  
19 breakages that you were considering.

20 A I think that's one of  
21 the major concerns we have. I think that probably there  
22 is well, depending on the kind of oil pipeline.

23 Q And why would a road  
24 be six to ten times more dangerous than a gas pipeline?

25 A Because roads, there are  
26 a considerable number of studies which indicate that  
27 roads are one of the major sources of sedimentation  
28 in streams. Most of the sedimentation that occurs in  
29 streams and has occurred historically has been as a  
30 result of road construction. In addition to that, of  
course, you have the culvert problem with roads which



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

1 is, I think, likely to be a serious one as far as  
2 fish populations go.

3 Q So it comes back to a  
4 similar situation as with the Great Bear River.

5 A No, it's not the same.

6 Q That of sedimentation  
7 and velocity.

8 A Well, in that very  
9 general sense. I might also point out, of course, that  
10 probably most important is that the roads provide  
11 access to the public, uncontrolled access, and the fish  
12 populations in the Arctic, particularly the sports fishes are  
13 extremely vulnerable to angling, and I think that this  
14 is very likely to be the major negative impact on  
15 fish populations in the future.

16 Q One of the fish about  
17 which you're most concerned, Dr. McCart, is the Arctic  
18 char, is it not?

19 A Yes.

20 Q And I wonder if you  
21 would agree with me with this catalogue of sensitive  
22 Arctic char water habitat, if you like. Craig Creek.

23 A No.

24 Q You wouldn't consider  
25 that to be sensitive?

26 A We don't know of any  
27 significant populations in there.

28 Q Fish Creek?

29 A Well, it, yes, it depends  
30 on which Fish Creek. You are speaking of the one near



1 Komakuk Beach, yes, that's a sensitive population.

3 A Except that the fish

7 Q And the Malcolm River and  
8 Firth River about which you've spoken earlier?

14 A No. I know of no  
15 population of Arctic char that inhabits the Crow River.  
16 We have picked up the occasional Arctic char there, but  
17 we know of no spawning in that vicinity, no major  
18 overwintering.

20 A Well, Phillips Bay of course  
21 could be occupied during the course of the year by  
22 fish moving from almost anywhere along the coast, and  
23 anadromous or sea-going Arctic char have a tendency  
24 to move along coast near shore and yes, Arctic char  
25 could be in there, I would say it's sensitive, however  
26 -- I wouldn't say it's sensitive.

28 A The Babbage River, yes,  
29 but again the populations are primarily situated  
30 considerably upstream of the pipeline, during the winter



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Gibbs

1 and for spawning purposes.

2 Q Blow River?

3 A No one has ever demonstra-  
4 ted that there is a population of Arctic char which  
5 either spawns or overwinters in great number in the  
6 Blow River.

7 Q Big Fish River?

8 A There is an important  
9 population of Arctic char in Big Fish River which is  
10 not on the prime route in the sense that it is not on  
11 the cross-delta route.

12 Q And you don't consider  
13 any of those that I have listed, except the Firth River,  
14 as being particularly sensitive in respect of Arctic  
15 char either for spawning or for overwintering?

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Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Gibbs.

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A For the Firth River, well  
it depends. If you mean are they sensitive to dis-  
ruption from the pipeline?

Q Yes.

A I would say that there  
are populations, the Firth River population, the Babbage  
River are far removed. I would be concerned about the  
fish creek population, that segment of it which appears  
to over-winter downstream of the population, oh sorry,  
the pipeline crossing. Most of it is upstream.

Q So with the exception of  
the Big Fish River, you don't see any potential damage  
to the Arctic char from the pipeline crossing or any  
of the others that I listed?

MR. MARSHALL: Did you mention  
Fish Creek?

MR. GIBBS: Fish Creek. I am  
sorry. I was Fish Creek.

A We are concerned and this  
was discussed at some length in phase two with popu-  
lations inhabiting springs, one of which is between  
the Firth and the Malcolm River.

Q Yes, but of the water courses  
if you like, that I listed to you, aside from Fish Creek  
you have no concern with damage to the Arctic char by  
reason of the pipeline crossing any of the others. Is  
that correct?

A Yes. Firth River and Fish  
Creek.



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Gibbs.

1

2

Q Thank you sir.

3

THE COMMISSIONER: Okay, we'll

4

adjourn then until 9:00 in the morning.

5

MR. MARSHALL: Commissioner,

6

perhaps before we break I might offer a suggestion. I

7

appreciate that you are anxious that we progress as

8

rapidly as we can through phase three and hopefully can

9

complete it prior to the Christmas break. It has

10

occurred to me that it might possibly assist some of

11

the counsel in the preparation of their cross-examination

12

if they, either they or they and their advisors, or

13

simply their advisors would have an opportunity to ask

14

some questions perhaps informally if some of the experts

15

were being called on some of the panels and I am prepared

16

to try that on an experimental basis if Dr. Fyles or

17

some of his advisors or some of Mr. Bayly's advisors

18

wish to ask some questions to help clarify and perhaps

19

more sharply define the areas that they are interested

20

in getting to. It may help all of us.

21

MR. BAYLY: I hope Mr. Marshall

22

doesn't mind sir, but I have been doing this for months.

23

THE COMMISSIONER: Well, I

24

think it is a constructive suggestion and whether it has

25

been done or not, I think that we can take it that

26

Dr. Fyles and the inquiry staff and the people assisting

27

other counsel and the Fopthills staff should feel free

28

to approach any members of the panel in the hotel or

29

on other occasions and just discuss these things in-

30

formally. That's what your suggesting?



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Gibbs.

1  
2  
3 MR. MARSHALL: Yes, I am not  
4 suggesting that the counsel should be grilling the  
5 panel off the stand but it seems to me that often some  
6 things could be cleared up informally and perhaps  
7 documents could be located and so on to pin-point the  
8 areas of concern and in that sense it could help all  
9 of us. The panel member, I am sure, would be happy to  
10 cooperate in that.

11 MR. GIBBS: As long as it  
12 doesn't have the effects sir, of the evidence which  
13 otherwise should be on the record and not appearing.

14 THE COMMISSIONER: Yes, it  
15 is the job of the lawyers to see that it is all on  
16 the records. Well we will see you all-- Well, I hope  
17 you will all come to the reception at 8:00 tonight at  
18 the Resources Building, the Inquiry Office. That is  
19 the building that needs a coat of paint opposite the  
20 Hudson's Bay and we will see you all tomorrow at 9:00,  
21 as well.

22 (PROCEEDINGS ADJOURNED TO NOVEMBER 20, 1975)  
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347  
M835  
Vol. 90

Mackenzie Valley pipeline inquiry:

TITLE

Vol. 90

19 November 1975

DATE DUE

BORROWER'S NAME

347  
M835  
Vol. 90





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MACKENZIE VALLEY PIPELINE INQUIRY

Goverment  
Publications

IN THE MATTER OF APPLICATIONS BY EACH OF

- (a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS CROWN LANDS WITHIN THE YUKON TERRITORY AND THE NORTHWEST TERRITORIES, and
  - (b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS CROWN LANDS WITHIN THE NORTHWEST TERRITORIES,
- FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION, OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.,

November 20, 1975.

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PROCEEDINGS AT INQUIRY

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Volume 91

CANADIAN ARCTIC  
GAS STUDY LTD.

DEC-8 1975

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E R R A T A

SUBMITTED BY JOHN BAYLY:

Volume 81, November 5/75 -

p. 12132, l. 25 - "spended" should be "suspended"

Volume 85, November 12/75 -

p. 12645, l. 29 - "radiant" should be "gradient"

347  
74133  
Vol 91

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APPEARANCES:

Mr. Ian G. Scott, Q.C.,  
Mr. Stephen T. Goudge,  
Mr. Alick Ryder and  
Mr. Ian Roland for Mackenzie Valley Pipeline  
Inquiry;

Mr. Pierre Genest, Q.C.,  
Mr. Jack Marshall, and  
Mr. Darryl Carter for Canadian Arctic Gas  
Pipeline Limited;  
Mr. Reginald Gibbs, Q.C.,  
Mr. Alan Hollingworth &  
Mr. John W. Lutes, for Foothills Pipe Lines Ltd.;

Mr. Russell Anthony &  
Pro. Alastair Lucas for Canadian Arctic Resources  
Committee;

Mr. Glen W. Bell and  
Mr. Gerry Sutton, for Northwest Territories  
Indian Brotherhood, and  
Metis Association of the  
Northwest Territories;

Mr. John Bayly  
or  
Miss Leslie Lane for Inuit Tapirisat of Canada,  
and The Committee for  
Original Peoples Entitle-  
ment;

Mr. Ron Veale and  
Mr. Allen Lueck for The Council for the Yukon  
Indians;

Mr. Carson H. Templeton, for Environment Protection  
Board;

Mr. David Reesor for Northwest Territories  
Association of Municipal-  
ities;

Mr. Murray Sigler for Northwest Territories  
Chamber of Commerce.



I N D E X

Page

WITNESSES FOR CANADIAN ARCTIC GAS PIPELINE LIMITED:

Alexander William Francis BANFIELD

Donald Laurie DABBS

William W.H. GUNN

Russell Alexander HEMSTOCK

Peter J. McCART

Ronald Daniel JAKIMCHUK

- Cross-Examination by Mr. Anthony (cont) 13767

- Cross-Examination by Mr. Bell 13901

- Cross-Examination by Mr. Bayly

Phillip Harvey DAU

- Cross-Examination by Mr. Gibbs (cont) 13845

- Cross-Examination by Mr. Goudge 13893

- Re-Examination 13895

- Re-Cross-Examination by Mr. Gibbs 13898



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

Yellowknife, N.W.T.

November 20, 1975.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

THE COMMISSIONER: Mr.

Anthony?

ALEXANDER WILLIAM FRANCIS  
BANFIELD

DONALD LAURIE DABBS

WILLIAM W.H. GUNN

RUSSELL ALEXANDER HEMSTOCK

PETER J. McCART

RONALD DANIEL JAKIMCHUK, resumed:

CROSS-EXAMINATION BY MR. ANTHONY (CONTINUED):

Q Dr. McCart, I wonder if we could start this morning by looking at your first page of your evidence, page 19 of the prepared text, and I'll read the sentence that I would like to discuss with you, and it's under the heading of "Critical Areas". It reads in part:

"The applicant has expended great effort in identifying areas potentially critical to populations of fish. These include spawning, rearing, and overwintering areas."

So that I understand the approach you've taken, would I be right in characterizing your approach towards environmental protection, at least as it relates to fish, as an identification of critical areas first of all, and then secondly satisfying yourself that the impact of the pipeline would not be detrimental to that area, and by extension to the fish that inhabit that area?

WITNESS McCART: Well, not entirely because we have generalized concerns as well



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 We are most concerned about critical areas because  
2 any detrimental effects in these areas would have the  
3 greatest effect on populations, but as I say, we do  
4 have some generalized concerns. We wouldn't want to  
5 see any long-term degradation in water quality in a  
6 stream despite the fact that a particular segment of  
7 a stream was not critical to a population of fish.

8 Q Well, it's the word  
9 "critical" that I'd like to discuss with you because  
10 I would like to know how you decide whether an area  
11 is critical and what criteria you use.

12 A O.K., a critical area  
13 to us is an area in which a change in the habitat would  
14 result in a reduction in total population size, and  
15 we're concerned about populations in this instance and  
16 if a change or some detrimental effect affects the  
17 population as a whole over a long period of time, or  
18 might affect them, we would classify this as a critical  
19 area.

20 Q So population size is  
21 in fact the central element of your definition of a  
22 critical area.

23 A That's right. Our intent  
24 is to maintain population size at their present levels.

25 Q Now, in response to a  
26 question by Mr. Gibbs, yesterday, about the Malcolm  
27 River, I believe you said -- and just correct me if  
28 I've got this wrong -- but I believe that you said  
29 that the Malcolm River was not considered a critical  
30 area because there were no significant fish populations



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 downstream of the pipeline, or at least you weren't  
2 aware of any.

3 A No, if I said that I  
4 certainly didn't mean to imply that. We know that  
5 there is an overwintering area downstream of the  
6 pipeline in a spawning -- sorry, in a spring area  
7 there, and we have pointed this out during Panel 2  
8 testimony; but I thought I was saying that I didn't  
9 feel that there was a significant population of  
10 Arctic char in the Malcolm River, anadromous  
11 Arctic char which was likely to be affected by the  
12 pipeline. As I pointed out, I think, in my Panel 2  
13 testimony people have been looking at the Malcolm River  
14 over the last four and five years but no one has yet  
15 identified large concentrations of anadromous fish in  
16 there, or any concentration of anadromous fish.

17 Q Again, using the language  
18 that you used, if you have determined as a result of  
19 your investigations that there are no significant fish  
20 populations downstream, would that exclude that area  
21 then as a significant or rather as a critical area in  
22 the way you use it?

23 A No, as I say I didn't  
24 mean to exclude that area. That area does harbor an  
25 overwintering population. They are rather vulnerable  
26 because they are closely confined in the vicinity of  
27 that spring during the course of the winter and if that  
28 area is to be used as a water source, you have to make  
29 -- apply very stringent controls to the way in which  
30 this water might be used, to ensure the survival of



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 that population. If in fact it is a population it strikes  
2 me that because the deltas of the Firth and the Malcolm  
3 interdigitate, this could be a segment of actually the  
4 Firth River Arctic char population which is overwinter-  
5 ing considerably to the west of the largest segment of  
6 the population.

7 Q Would I be right in  
8 again dealing with your definition of "critical areas  
9 and populations", that element, that if you were  
10 satisfied that there was no fish population or as you  
11 say, significant fish population, would that then mean  
12 that that area would not be a critical area?

13 A If I were satisfied that  
14 the area was not used as a spawning, overwintering, or  
15 overwintering area, in other words there are large  
16 stretches of stream which are utilized by fish but  
17 utilized as feeding areas by adults and things of this  
18 sort, or as migration routes during a portion of the  
19 year, and the population could probably withstand some  
20 short-term degradation in those areas. Of course  
21 this occurs naturally in the population -- there's  
22 no evidence that the population would crash as a  
23 result of slumping along the Firth River, natural  
24 slumping and this kind of thing. So this I wouldn't  
25 consider to be a critical area.

26 Q And again in understanding  
27 the term "critical area", you would now -- have dealt  
28 with the question of population and you've also  
29 indicated the water quality, an area of particular  
30 water quality or chemical characteristics, you may wish



Banfield, Dabbs, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 to define as a critical area for that reason, irres-  
2 pective of the number of fish that actually inhabit it.  
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Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

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A Well, let's put it this way that generally spawning areas are areas which have been selected by fish populations because they do have particular characteristics.. Yes, water quality and physical characteristics, <sup>presence of gravel</sup> presence of flowing water and that kind of thing, yes.

Q Would you also include in your definition of a critical area, an area that is a traditional fishing area and I was concentrating on the fishery as distinct from the fish?

A Well, it may or may not be. I might point out that a lot of traditional fishing areas are in fact located in what I classify critical areas because <sup>in fact</sup> they concentrate on spawning populations or over-wintering populations and this is certainly true of Arctic char, domestic Arctic char fisheries all along the North Slope.

This is exactly where these fisheries take place.

Q If you had a locality that was important to the, to perhaps even a small number of people as a fishery source, would this then be included as a critical area within the way you have defined it and used it?

A No, but of course we do take cognizance of the presense of domestic fisheries and try to avoid them and make recommendations to mitigate any effects on the fishery.

Q Now, you have indicated that



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 you try to identify critical areas and as you state  
3 there, includes spawning, rearing and over-wintering  
4 areas, did you also then include in your <sup>definition</sup> areas of  
5 traditional importance.

6 A Well, in some cases these  
7 are areas of traditional importance. Let me go back.  
8 I am talking about areas that are critical to fish  
9 populations. Now there may be additional areas that  
10 are critical to human populations and these might,  
11 in fact, be domestic fishing areas.

12 Yes, but that is not what I  
13 am talking about, when I am talking about a critical  
14 area with respect to fish populations, no.

15 Q But have you as part of  
16 your fish protection process identified these areas and  
17 advised Arctic Gas of their location?

18 A We have prepared a report  
19 on the location of domestic fishing sites in the corridor  
20 yes.

21 And in a few occasions where  
22 the line impinges on domestic fishing sites, we have  
23 indicated this to Arctic Gas and I think you will find  
24 that some of these are identified on the alignment sheets.

25 Q Could you perhaps identify  
26 that report that you prepared outlining traditional  
27 fishing areas within the alignment so we might have a  
28 look at it?

29 A This is a report that has  
30 been prepared and will form part of the biological report



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 series but has not yet been printed.

3 Q Has the report been pre-  
4 pared though?

5 A Yes.

6 Q I wonder Mr. Marshall if  
7 we might have that report so that we can examine it and  
8 perhaps discuss it over the term?

9 MR. MARSHALL: I will try to  
10 get you a copy of it? Do you have an extra copy Dr.?

11 A I think I only have a  
12 single copy with me so it would have to be reproduced.

13 MR. MARSHALL: We'll get a  
14 copy for you.

15 MR. ANTHONY: I wonder if, to  
16 assist other counsel who obviously would be interested  
17 in this, if it could, if a copy could be reproduced  
18 and left at the library here in Yellowknife, over the  
19 next week in particular. Thank you.

20 Mr. Commissioner, Mr. Marshall  
21 asked that when I reached the logical breaking point  
22 that he be allowed to say something before we proceed.

23 THE COMMISSIONER: Yes.

24 MR. MARSHALL: Yes, sir. I  
25 take it that counsel had completed their cross-examination  
26 of Mr. Dabbs in matters pertaining to vegetation, at  
27 least for the moment.

28 I gather that some of them may  
29 want to ask him some questions when they get to a later  
30 stage in their cross-examination of this panel, dealing



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 with impact assessment and so on. So, what I would  
3 propose sir, with you leave, is that Mr. Dabbs be  
4 temporarily excused and invited to return then, I guess  
5 it will be during the week of the 2nd of December.

6 If any of the counsel require  
7 him here he would be happy to stay. If not, he will  
8 get back to work.

9 MR. RYDER: We see no objection  
10 in that.

11 THE COMMISSIONER: Well, fine.  
12 Well Dr. Dabbs, your excused and unless Mr. Marshall  
13 advises you otherwise we'll look forward to seeing you  
14 a week Monday at 1:00.

15 MR. DABBS: Thank you sir.

16 MR. MARSHALL: There was one  
17 other matter too, sir, that I suppose could be left to  
18 redirect but it may be more useful if it is brought  
19 up now so that counsel can ask questions of it if they  
20 choose.

21 You will recall that Mr. Gibbs  
22 was asking a number of questions of Dr. McCart about  
23 a crossing of the Great Bear River. Dr. McCart has  
24 been in touch with Mr. Williams this morning and he had  
25 some more information about that crossing/<sup>that is</sup> Germaine  
26 and he has additional information about the crossing  
27 of the east channel of the Mackenzie River with the  
28 re-routing for the cross-delta route and I would like  
29 Dr. McCart to comment on that now sir, if I may.

30 THE COMMISSIONER: Yes, certainly



Banfield, Dabbs, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 Go ahead Dr. McCart.

3 (WITNESS DABB ASIDE)

4 WITNESS MCCART: Yes, I  
5 talked to Mr. Williams on the phone this morning and he  
6 if you remember, indicated in his panel two testimony  
7 that the Great Bear River crossing had been relocated  
8 to what we consider to be a more favourable site and  
9 informs me that the new location is much better suited  
10 to conventional construction techniques and that it  
11 may be possible to either reduce the length of the berm  
12 required or eliminate it entirely at the <sup>new</sup> location on  
13 the Great Bear River.

14 We also discussed the crossing  
15 which would be associated with the new cross-delta  
16 routing and he tells me that the same thing is true  
17 there for the new cross-delta crossing of the east  
18 channel of the Mackenzie River in the vicinity of  
19 Tununuk Point.

20 At the new location there are  
21 none of the extensive flats which necessitated a long  
22 berm at the original Swimming Point location.  
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Banfield, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 And that here again it may be able -- it is likely that  
2 it would very much reduce or entirely eliminate the  
3 necessity for a berm, and I would point out that as a  
4 fisheries biologist concerned about water quality, I  
5 would certainly be in favor of any change which reduced  
6 the level of activity in the active channel, and by  
7 either reducing the length of the berm or eliminating  
8 it, this would in fact reduce the time period and the  
9 amount of activity which would be required in the  
10 active channel of these streams.

11 MR. MARSHALL:

12 Thank you, sir, thank  
13 you Mr. Anthony.

14 MR. RYDER: Can I just clarify  
15 that, Mr. Chairman and ask Mr. Marshall if those are  
16 firm decisions now that we can deal with, or are they  
17 still under consideration or haven't been firmly taken?  
18 Particularly the Bear River crossing.

19 MR. MARSHALL: Well, my  
20 information is just what you've heard. That is that  
21 the river crossing has been moved.

22 THE COMMISSIONER: That is  
23 their latest thinking. If they find a better site  
24 they'll let us know. I don't think we can ask them  
25 to do much more.

26 MR. RYDER: As I said, he  
27 did discuss this in his Panel 2 testimony and the word-  
28 ing there might give you some indication.

29 MR. ANTHONY: Q Dr. McCart,  
30 in looking through the reports that you've prepared  
on behalf of the Biological Report series, and as part



Banfield, Gunn  
Hemstock, McCart, Jakimchuk  
Cross-Exam by Anthony

1 of the Biological Report series, I believe that they  
2 indicate your investigations of the pipeline impact  
3 on critical areas in the Mackenzie Valley started in  
4 1973. Is that -- April '73.

5 WITNESS MCCART: I think we  
6 in fact began work in April of '72 in the Mackenzie  
7 Valley.

8 Q When you started your  
9 impact assessment survey, had the route -- had the  
10 alignment down the Mackenzie Valley already been selec-  
11 ted?

12 A At the time I started we  
13 were still considering both an east and west of the  
14 Mackenzie routing, so apparently not. That may have  
15 been '71, I'm not certain. I think we did in fact  
16 start working in the Donnelly River area in 1971.

17 Q Your surveys themselves --

18 A That was not so much a  
19 survey, although there was a survey associated with  
20 it in order to choose that particular site.

21 Q And what about the portion  
22 of the route across the North Slope, is that again  
23 an alignment provided or --

24 A The general alignment,  
25 I think, was in existence. I have some recollection and  
26 it was moved farther into the foothills at one point,  
27 I'm not certain of that. But it was within the general  
28 area of the foothills at that time, yes.

29 Q And am I right in your  
30 identification of critical areas and as part of your  
survey



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1           you consider impacts as they relate to a gas  
2 pipeline alone? Is that the way I understand your  
3 testimony?

4                           A       Yes, that was our major  
5 concern.

6                           Q       And that if you were to  
7 consider a gas and an oil pipeline, do I understand  
8 from what you said yesterday that you may in fact have  
9 more critical areas or different critical areas when  
10 you consider the problems of oil dispersal?

11                          A       No, by my definition of  
12 "critical area", to fish, regardless of what potential  
13 impacts there are, it may be that in a particular  
14 instance the gas pipeline and its facilities may have  
15 a greater impact than an oil pipeline, and in some  
16 instances an oil pipeline might have a greater effect  
17 on a particular critical area than a gas pipeline,  
18 depending on the particular construction techniques  
19 and particular facilities associated with either one  
20 or the other of these two.

21                          Q       But if I was to ask you  
22 to identify critical areas as you have when you did the  
23 work for Arctic Gas, would you not expect you would  
24 add to your list of critical areas if you were to  
25 consider the impact, the cumulative impact of both  
26 lines?

27                          A       Well, in the sense that  
28 an oil pipeline routing is likely to be different in  
29 some areas at least from that of a gas pipeline, we  
30 would go and look in the vicinity of that particular



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 routing and look for other critical areas, so we would  
2 be adding to our information in that way.

3 Q As part of your examination  
4 did you also examine the potential impacts beyond the  
5 general alignments you got on the North Slope and down  
6 the east and west side of the Mackenzie?

7 A You mean did we work  
8 outside of the very narrow corridor in doing this?

9 Q Yes.

10 A Yes, we did, certainly.  
11 The Firth River, for instance, we worked up to the  
12 Alaskan border, and in fact did one survey with our  
13 Alaskan crew on that side of the border, as an example.  
14 So in particular in some instances we did Babbage  
15 River, we examined fish populations in the Babbage  
16 River as far as its headwaters.

17 Q Did you also examine  
18 the potential impacts in the alternative routes that  
19 were referred to in the Arctic Gas application? The  
20 Fairbanks corridor and so on?

21 A We did in the sense that  
22 we did a literature survey and we undertook to talk to  
23 people in both, Whitehorse Fisheries people in both  
24 Whitehorse and Fairbanks and in <sup>Juneau</sup> and we examined  
25 their files which were opened to us, and that information  
26 is included as part of our assessment. The actual data  
27 on fish distributions is one of the chapters in the  
28 Biological Report series.

29 Q And as a result of that  
30 research, did you come to any general conclusions as



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 to suitability of those routes as compared to the  
2 prime route, or the interior route?

3 A Yes, we did.

4 Q What conclusion did  
5 you come to?

6 A Our general conclusion  
7 was that if we were considering only Alaskan gas from  
8 Prudhoe Bay, we would prefer the Fairbanks corridor.  
9 But that if we were considering gas production in both  
10 the Mackenzie Delta and at Prudhoe Bay, we would prefer  
11 the prime route.

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Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 Q In your examination did  
2 you also examine east of the Franklin Mountains rather  
3 than the Mackenzie Valley drainage itself?

4 A No, we did not.

5 Q Do you have any experience  
6 or knowledge of that area in a general sense that would  
7 enable you to make a general assessment or comment?

8 A Well, I have very little  
9 information. The only piece of information I have  
10 is that there are fewer stream crossings east of the  
11 Franklins, it's purely statistical.

12 THE COMMISSIONER: Going back  
13 a minute, Dr. McCart, you said that if it were only  
14 a question of bringing Prudhoe Bay gas by some route  
15 south to the United States, you would prefer the Fair-  
16 banks corridor to the route along the North Coast and  
17 hence south up the Mackenzie. I take it that would  
18 be because you would have a convenient way of taking  
19 the gas out without disturbing the North Coast of  
20 Alaska or the Yukon. Would that be a principal consider-  
21 ation?

22 A Yes, we did a statistical  
23 comparison and compared the number of stream crossings,  
24 both minor stream crossings and major stream crossings.  
25 We considered the number of miles of pipeline parallel  
26 to streams. Our feeling is that where a pipeline parallel  
27 els a stream for a considerable distance, the potential  
28 for damage is greater than where it crosses it at a  
29 single point at right angles. We also considered  
30 the number of lakes within, I think it was <sup>within</sup> a mile of



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 the pipeline route, and using these things, we came  
2 up with, the other thing I should point out, we also  
3 considered the number of existing miles of road.  
4 Our feeling being there that if there's a road already  
5 present, that the additional logistic facilities might  
6 be reduced. Now that's not entirely relevant in a  
7 situation where you're building a winter road of  
8 snow, but using all of these, and also the number of  
9 miles of pipeline, we did come up with a preference  
10 for that, the Fairbanks corridor, if Prudhoe Bay gas  
11 were the only one under consideration.

12 However, if you wish to  
13 withdraw gas from both of these areas, and you're  
14 going to use the Fairbanks corridor, it means that  
15 you still have to build a route down the Mackenzie  
16 Highway to remove that gas and therefore you increase  
17 by a considerable margin the number of miles of  
18 pipeline, the number of stream crossings, etc. etc.

19 MR. ANTHONY: Q Dr. McCart,  
20 did your assessment and study, in fact your comments  
21 you made in evidence, include the cross-delta route  
22 as it now is, or are your conclusions based on the  
23 old prime route?

24 A On the old prime route.

25 Q Did your studies or the  
26 studies that you are able to comment on now include  
27 the new prime route, the cross-delta portion?

28 A We have been studying  
29 that and the analysis to date is under way. We expect  
30 to have a report in the next month or two.



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 Q So you're not at present  
2 able to provide us with an assessment of the impact on  
3 fish and fisheries in the delta areas. This requires  
4 this report to be put together.

5 A I would prefer to leave  
6 that.

7 Q And you similarly have  
8 not communicated any potential impact assessment to  
9 Mr. Williams or the engineers and so on until you've  
10 had a chance to assess this material?

11 A Well, we have provided  
12 them with a preliminary indication of what we think  
13 the impacts, major impacts might be.

14 Q Would you indicate to this  
15 Inquiry what your preliminary assessments are?

16 MR. MARSHALL: Well, Mr.  
17 Commissioner, I discussed this with Dr. McCart earlier  
18 and while indeed he could say something now about  
19 preliminary assessment impacts, he feels that it is  
20 preliminary and wouldn't be based on a complete  
21 analysis of the data that's available, and he feels  
22 that really he ought not to express an opinion now,  
23 particularly in a formal hearing, when he hasn't had  
24 a chance to analyze all of the data.

25 I appreciate my friend's  
26 concern and his interest in the subject. We could be  
27 of some help but it would mean that the final analysis  
28 would be kind of counter-productive. Dr. McCart would  
29 prefer to deal with this thoroughly at a later date,  
30 if he may, at Inuvik.



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

MR. ANTHONY: Mr. Commissioner,

I would agree with that, and I look forward to a more formal assessment. The reason for the question and why I think that perhaps a response now might be of assistance is that Arctic Gas has indicated to us that route changes and route alignments have been based on an environmental as well as engineering assessment and we now have a formal route alignment change, and if in fact there has been an assessment I'd like to get an idea of what information or what level of assessment, in environmental terms, was available to Arctic Gas when they made a route change. I appreciate that it's preliminary and he's made that very clear, but I think that it may be instructive to us to know what the level of work that was done when a route change was in fact made, not merely contemplated but in fact made.

THE COMMISSIONER: Well, we're going to Inuvik in January for a month or more to consider the cross-delta route, and related questions. I'm not convinced there's any advantage in opening the subject up now. Certainly I'd like to know too. Dr. Gunn has been good enough to give us a two words insight into his opinion of the matter, but if Dr. McCart is unwilling to do so now, in the same way, I'm inclined to think you should leave it, because it isn't something on which I'd allow extensive cross-examination at this stage anyway. Do you want to help us out, Mr. Byder? Do you have any views on this?



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1  
2 MR. RYDER: As I understand  
3 Mr. Anthony, what he is seeking is the level of infor-  
4 mation that Arctic Gas had at its disposal of the  
5 environmental impact. of the cross-delta route  
6 prior to the selection of that route as their prime  
7 route, to see what influence that information had on  
8 the selection of it.

9 THE COMMISSIONER: Yes, but  
10 where does that get us? Maybe these people are  
11 great decision-makers and everything is done in a way  
12 that none of us would take exception to, maybe they're  
13 not, but in the final analysis the Inquiry has to  
14 recommend what route this thing ought to take. Why does  
15 it help us to hear what McCart told Williams and Williams  
16 told Horte and so-and-so told somebody else? Is that  
17 getting us anywhere? Because the Inquiry has to make  
18 a recommendation in the final analysis, on the evidence  
19 that it hears and not just what these gentlemen say, but  
20 what the Inuit people who live up in the delta say ,  
21 what others have to say, and I'm certainly open to  
22 persuasion but I don't see where this kind of thing  
23 gets us.  
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Banfield, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 Q Sir, I wonder if I might  
3 attempt to say at least at this point  
4 if we could inquire at least the types of studies  
5 that were done before a route change was made. I think  
6 that if Arctic Gas, as they have, has taken the position  
7 that they had environmental as well as engineering  
8 input, before a decision is made, I would think that  
9 whether we ask it now or ask it at Inuvik, the answer  
10 will be the same.

11 In other words, what studies  
12 were done before a route change was made and that's  
13 really what I am attempting to inquire. If in fact--

14 THE COMMISSIONER: Well, I  
15 will tell you what my assessment<sup>has been</sup> on the evidence to  
16 this point, preliminary assessment, as we say.

17 Mr. Dau told us that this  
18 route change across the delta was under consideration  
19 even before the application was filed in March, 1974 to  
20 build any pipeline.

21 It was made plain that Arctic  
22 Gas felt that there would be considerable financial  
23 saving, 100,000,000 we were told and they then said to  
24 the environmental people, well will you take a look at  
25 this route for us?

26 We had the impression that it  
27 would be an environmental mistake, that very great  
28 damage would be caused if we crossed the delta, crossed  
29 the mouth of the delta but now we want you to take a  
30 hard look at this and it is apparent of the basis of the



Banfield, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 kind of preliminary assessment, Dr. McCart has given  
3 them, they indicated they want to change the route.

4 Now that seems obvious to me  
5 and so what. At the end of the day I have to make  
6 recommendations to the Federal Government about this  
7 thing and does it help me to know how Arctic Gas reached  
8 the stage of figuring out what route they wanted.

9 MR. ANTHONY: Mr. Commissioner,  
10 I think from my perspective, what I may be urging to you  
11 at some stage in this Inquiry is that, that one of  
12 your recommendations be that there be further research  
13 done before any route alignment changes<sup>and so on</sup> are made and  
14 perhaps even recommending minimum types of studies  
15 that should be <sup>conducted</sup> / <sup>route</sup> before a change is made.

16 Now, we have the situation here  
17 for expected environmental reasons. The route went  
18 around the Mackenzie Delta and now we are told that they  
19 are going to go across the Mackenzie Delta presumably  
20 because they are satisfied themselves, or whatever the  
21 environmental dangers were, they no longer exist or  
22 if they exist, they--

23 THE COMMISSIONER: Let me  
24 interrupt you. My preliminary assessment of the  
25 evidence, subject to what everybody may still say in  
26 the months remaining to us, is that they decided there  
27 was distinct financial advantage for going across the  
28 mouth of the delta.

29 They thought they would save  
30 money. Now, there is nothing wrong with that. So, then



Banfield, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 they said, all right we want to do this.

3 Now, McCart, Hemstock, Gunn,  
4 Banfield, Jakimchuk, will you please tell us what the  
5 environmental losses will be if we take that route.  
6 They got the returns, the preliminary returns recently,  
7 sometime this fall and they said, well let's tell the  
8 Energy Board and let's tell Berger that we want to take  
9 that route.

10 That is what I think happened  
11 on the basis I have heard so far. I hope I am not doing  
12 an injustice to Arctic Gas. I don't see anything wrong  
13 with the procedure they followed. They thought they  
14 would save some money so they wanted to check that out  
15 from an environmental standpoint.

16 MR. ANTHONY: I agree with you  
17 sir and that is my understanding of what happened too  
18 and I am merely trying to find out what environmental  
19 checking they felt was needed, before they could approve  
20 a route change.

21 Now, I agree if it was a matter  
22 of consideration, we could say well that's fine but I  
23 am thinking in terms of the sorts of studies that they  
24 conducted that allowed them to satisfy themselves that  
25 they can now go ahead with the proposed route change  
26 and we may very well wish to say to you at some stage,  
27 sir, that if that is the way the route changes are  
28 being made, it is inadequate and we should recommend  
29 that certain very different sort of research be required  
30 before any route changes are approved or applied for.



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Cross-Exam by Anthony.

1  
2 THE COMMISSIONER: Now, if that  
3 is a sound proposition it may well be, I recommend it.  
4 Surely it depends on the state of the evidence, when the  
5 Inquiry is concluded and not on the decision making  
6 process that Arctic Gas has followed. I think you should  
7 make your intervention official Mr. Bayly.

8 MR. BAYLY: Thank you Mr.  
9 Commissioner. My concern is that we were told by  
10 Arctic Gas through it's counsel, Mr. Marshall, that  
11 although the cross-delta route was an alternate that  
12 they were considering, that they could not apply for  
13 it as their official prime route until they had an  
14 indication from their environmentalists that it was  
15 safe to cross it and everytime we had asked Mr. Marshall  
16 he said wait to the fall of 1975 when the reports are  
17 in that say it is environmentally safe to cross the delta.

18 Now, my concern, sir, is one that  
19 Mr. Anthony has been expressing. I would like to know  
20 from these gentlemen how they have determined that it  
21 is safe or if they have determined tentatively that it  
22 is safe and that there are so many more studies that  
23 have to be done before they could confirm that.

24 These are things that are vital  
25 I submit. First of all whether the delta would be crossed  
26 at all in your recommendation and secondly whether you  
27 are to recommend that whatever years of study are still  
28 required, that they be done prior to making that  
29 decision, if that turns out to be the gist of the  
30 evidence we get from this panel.



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1  
2 THE COMMISSIONER: Let me  
3 stop you Mr. Bayly. Theres two things I don't follow  
4 and maybe it's-- One is I still don't see why we  
5 have to spend a lot of time finding out at what stage  
6 McCart's work was at when he said to Williams, "Well  
7 this looks okay", or when Gunn said to Williams, "I  
8 have got serious reservations about this whole delta  
9 crossing".

10 Now the second thing I don't  
11 quite understand is, I think I am beginning to under-  
12 stand that first thing. The second thing I don't  
13 understand is why are we doing this now when we are  
14 going to do it all over again in Inuvik? Are we gaining  
15 anything by exploring it now?

16 MR. BAYLY: My assumption sir,  
17 is that we were not going to bring, or find that we  
18 had the entire environmental panel back in Inuvik to  
19 discuss that particular area of the route and there  
20 may be some advantage in discussing the things they have  
21 done this summer that lead to this decision while we  
22 have them here.

23 Now that may be an advantage  
24 to Mr. Marshall as well. If they can't discuss it  
25 because they haven't made the conclusions in their  
26 reports, we should know that too, because that is  
27 certainly important in the decision making process for  
28 crossing the delta and it may mean that it has been  
29 made already without <sup>finally having</sup> the environmental okay. We  
30 already have Dr. Banfield giving us a philisophical



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1  
2 approach to decision making on engineering, environ-  
3 mental cooperative basis. It would be interesting to  
4 know, I submit, that that is truly the way that  
5 Arctic Gas made its decision or whether in this case,  
6 because they were faced with deadlines, they short-  
7 circuited that process.

8 MR. MARSHALL: It seems to me  
9 that what really matters is what the impacts are and  
10 groping at the dark, the right decision were arrived  
11 at, that's really the only important consideration. Is  
12 that the right decision or is that not the right  
13 decision? Now the decision wasn't arrived at by groping  
14 in the dark. These gentlemen have all done fairly  
15 extensive studies and Dr. McCart as a professional has  
16 reservations about stating an opinion in a formal  
17 hearing until he has completely analyzed his data and  
18 I must say I sympathize with him.

19 I have checked with Mr. Hemstock  
20 and it is my feeling and he agrees that when we come  
21 to deal with the cross-delta evidence that we ought to  
22 call the environmental consultants to give evidence as  
23 to the studies they carried out and I appreciate that  
24 my friends are very interested in this subject and in  
25 order to do justice to it we should bring forward the  
26 environmental consultants, Dr. Gunn, McCart and Jakimchuk  
27 and so on who have done the work and that is what I  
28 intend to do.

29 So, if they wish to go into  
30 great detail on the studies that have been carried out,



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1  
2 they will have amply opportunity to do that.

3 MR. BAYLY: Well sir, if Mr.  
4 Marshall is prepared to do that and that's the way he  
5 wants to lead the case, to bring the panel back to  
6 discuss those things, you have my objection, I am  
7 prepared to withdraw my objection.

8 MR. ANTHONY: There is that  
9 indication that we will be able to discuss this subject.  
10 I am still anxious to ensure that the matter/<sup>is being</sup> deferred  
11 to a later stage, I appreciate that and I am prepared  
12 to proceed with that and perhaps it might be of some  
13 use if counsel, before that, had a chance to discuss the  
14 issue and perhaps review your comments today, because  
15 I am still in the view that given this sort of evidence  
16 that Dr. Banfield has lead which indicates the inter-  
17 action between the engineers and the environmentalists  
18 in group change and in decision making.

19 And in view of Dr. McCart's  
20 evidence before us about site specific and the man had  
21 to be there and you can't just plan and make recom-  
22 mendations in the air, then it is very important to know  
23 what information if available and how the decisions  
24 have been made and the subject has been raised and I  
25 think quite properly/<sup>so</sup> by Dr. Banfield and I would be  
26 anxious to pursue that question so that we can make  
27 recommendations as to how environmental assessment is  
28 carried out and how pipeline routing and pipeline  
29 decisions should be carried out and I am prepared to  
30 defer that but I would hope that I would have an op-



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1  
2 opportunity to discuss that with, with--

3 COMMISSIONER: What your saying in a way  
4 is that-- You see Mr. Marshall is right. It is  
5 what is the impact going to be? That is the first  
6 task of this Inquiry. Now, it may be an extremely  
7 difficult one and these gentlemen may even jeer at the  
8 notion that you can, in any reasonable way, predict it.  
9 But we have to do the best we can.

10 The other thing is we have  
11 to make terms and recommendations. It seems to me  
12 that where your leading is this. Your suggesting this  
13 Inquiry ought to recommend the way in which corporate  
14 decision makers ought to integrate environmental  
15 knowledge and experience into the decision making  
16 process as regards to the large projects and that may  
17 well be going down the terms of reference of the Inquiry.  
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Cross-Exam by Anthony

1 MR. ANTHONY: Mr. Commissioner,  
2 it gets to the point that the answers we've had  
3 continually about, this is a matter of final design, or  
4 this is a matter of site specific enforcement has  
5 some meaning, and I think the only way it has meaning  
6 is if we look at the question of implementation and  
7 enforcement of environmental protection measures, and  
8 we certainly, from our point of view, regard the implemen-  
9 tation and enforcement of environmental protection  
10 measures as a crucial issue in this whole Inquiry, and  
11 we are -- we believe in the sincerity of people like  
12 Dr. Gunn and Dr. McCart and that they are attempting to--

13 THE COMMISSIONER: And others.

14 MR. ANTHONY: -- and others,  
15 I certainly didn't intend to exclude anyone. We  
16 certainly believe that they are sincere and that they  
17 in fact have evaluated impact, but what we're concerned  
18 with too is that there be recommendations made by this  
19 Inquiry as to how these impact techniques are then  
20 enforced and implemented, and that the environmental  
21 protection is not a matter of assessing impact and  
22 stopping, but in fact ensuring that it's carried through  
23 to the final design and actual construction.

24 THE COMMISSIONER: Well, let  
25 me stop you there. I agree with everything you've  
26 just said, just the way in which the earlier subject  
27 is linked to that still alludes me. Maybe it's my  
28 fault. Why don't we leave this and these people aren't  
29 going to go away till tomorrow, so let's all think  
30 about it and maybe if I-- when this has had a



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1 chance to sink in -- if I'm closer to your point of  
2 view I'll let you know at the beginning of the afternoon  
3 session, and in the meantime you carry on with whatever  
4 comes on the next page after that.

5 MR. MARSHALL: I should tell  
6 you, Mr. Anthony and the other counsel, that while I  
7 would expect to bring back the biologists who have  
8 been involved in doing the field studies, the  
9 representative you see here, Dr. Banfield has told me  
10 that he is going to be teaching in January in Scotland  
11 and we don't expect that he'll be coming back, but he  
12 has not been directly involved in the carrying out of  
13 the studies and various disciplines pertaining to  
14 the studies.

15 THE COMMISSIONER: It may be  
16 then that you might use this opportunity -- I don't  
17 mean right now -- but before Dr. Banfield returns you  
18 might use the opportunity that was given by his  
19 presence here to ask him some questions about the  
20 delta route.

21 MR. MARSHALL: Yes sir, I  
22 think he's prepared to speak to that.

23 MR. ANTHONY: Perhaps in light  
24 of the discussion I'll leave the subject entirely until  
25 I too have had an opportunity to crystalize my  
26 thinking on the point, and Dr. Banfield will be back  
27 on December 2nd and perhaps we could then discuss the  
28 issues that he's raised in his evidence, in any event,  
29 perhaps using the cross-delta merely as an example  
30 of the process rather than the specific impact.



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THE COMMISSIONER: Good.

MR. ANTHONY: Q Dr. McCart,

I wonder if we could go back to this question of critical area, and I would like to, if I may, ask you to apply your definition in indicating whether or not specific locations in your assessment are critical areas as you have defined them, and as you have advised Arctic Gas, and I'm wondering maybe to short-circuit rather than go through a long numerous list, if you could take a look at the Pipeline Application Assessment Group Report at page 326? That report, I'm really just using the table of areas rather than the context within which it's used and they're dealing there with toxic substances in particular. But I would ask you if you would examine those list of the critical areas, as they have defined them there, and advise whether in the definition, do they satisfy your definition of "critical areas"? In other words, have you identified these as critical areas <sup>applying</sup> the criteria and the standards that you have used?

MR. MARSHALL: I note they use the term "sensitive". I don't know whether that has the same meaning.

MR. ANTHONY: I'm sure it does and I'm sure the context is different, and I was merely trying to, rather than read a list of places and say, "Does that satisfy your criteria?" I was trying to short-circuit it by using this list and ask Dr. McCart if he would agree that these satisfy his definition, in other words if he can identify



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1 these as critical areas in the work he's done, and if  
2 <sup>those</sup> not, why are/particular locations not considered critical  
3 under the terms that he is using.

4 A Well, my definition of  
5 "critical areas" doesn't include entire streams, and  
6 in many cases they -- for instance, they say the  
7 Firth River, and I would say, yes there are critical  
8 areas, a number of them on the Firth River, but I would  
9 not say that the Firth River in its entirety is a  
10 critical area. So that they don't really correspond.  
11 Rat River is listed here as being critical or is listed  
12 here, and certainly there are critical areas on the  
13 Rat River, in the headwaters where the fish overwinter  
14 and spawn; but the entire Rat River is not a critical  
15 area and the crossing, as far as I can see, does not  
16 occur in what I would consider to be a critical area.

17 Q Could you --

18 A Well, I could go through  
19 each one of these and comment on them, but I think that  
20 would take an awfully long time, and we have in fact  
21 indicated in Volume 16 and on the alignment sheets where  
22 in each of these cases we feel that there might be a  
23 critical area in the vicinity of the crossing site.

24 Q Well you see, Dr. McCart,  
25 you have indicated that where there are critical areas  
26 you would expect the sort of review and consultation  
27 that you discussed in your Phase 2 evidence, and that  
28 you had examined the crossing and given some advice.  
29 Now, what I am attempting to determine is whether there  
30 are locations which others have identified as part of



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1 the route as being critical and should we go through  
2 this process of examination where you, from your estimation  
3 -- estimation and from your research say, "No, it's  
4 really not an area where I have to go through this  
5 process because I don't regard it as a critical area."  
6 Because there may be others that say, "Well, that's  
7 obvious then that McCart's definition is too broad  
8 or too narrow, he's defining 'critical' in too narrow  
9 a term." The recommendation would be that you would  
10 broaden your term to include --

11 A Well look, I have  
12 defined "critical area." I've indicated in Volume 16  
13 and the other catalogues we've produced where we con-  
14 sider critical areas to be. We have indicated on the  
15 alignment sheets where critical areas are either within  
16 the compass of the alignment sheet or in the immediate  
17 vicinity either downstream or upstream, even if they're  
18 off the alignment sheet, and/<sup>if</sup>people disagree with this  
19 I would like to hear about it. As I said before, we  
20 put these things in loose-leaf format so that as additional  
21 information becomes available we can incorporate it.

22 Q Well, perhaps this would  
23 assist me then. As I understand, Volume 16 was not a  
24 bringing together and an evaluative process. In other  
25 words, it was an identification of particular areas,  
26 an identification of significant features of those areas.  
27 Now, am I right in what you're saying now is that in  
28 Volume -- we find in Volume 16 that you used the  
29 term "critical" in describing a particular location,  
30 that then satisfies your definition of a critical area.



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1                                   A       Yes.       Of course we  
2 use the term "critical area" in Volume 16 as I've  
3 used it in the past. We indicate where there is infor-  
4 mation, indicating that there might be a critical area  
5 at one point five miles upstream or something of this  
6 nature, or whatever. We are interested in specific  
7 localities. As I say, we don't classify entire streams  
8 as critical areas. There may be a multitude of them  
9 in there, but we don't classify entire streams as  
10 critical areas.

11                                  Q       But the use of the phrase,  
12 "critical areas" in Volume 16 corresponds with your  
13 discussion we've had about the definition of critical  
14 for purposes of special protection techniques and so on.

15                                  A       Yes.

16                                  Q       If I can just deal with  
17 a specific example, in answering Mr. Gibbs yesterday  
18 you agreed that the Firth area was a critical area or  
19 the Firth River was critical in particular areas, was  
20 a critical area. Have you therefore made specific  
21 recommendations on that crossing?

22                                  A       I don't think I indicated  
23 that the area of the crossing was a critical area and  
24 in fact we've looked at the crossing on a number of  
25 occasions and find that the crossing is dry during the  
26 winter period. Now, there is a critical area downstream  
27 of the crossing and we have identified this or would  
28 identify this as a critical area because there is an  
29 overwintering population there, and I think in Phase 2  
30 we indicated repeatedly that in these instances we are



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1 concerned about one problem, that is the problem that  
2 by ditching through upstream of a spring or aquifer  
3 you may in fact impede the flow and cause a cessation  
4 of flow at the spring; or if it's downstream, in the  
5 vicinity of the critical area. Certainly we are  
6 concerned about that, but that is not at the crossing  
7 site, that is downstream, and in fact our drilling  
8 program and geotechnical analyses may indicate that  
9 there is no problem there.

10 Q Yes, but the question was  
11 dealing now with that stream crossing as merely an  
12 example, did you then make specific recommendations  
13 as to how construction should be carried on at that  
14 location? You have identified general problems, and  
15 I appreciate those, and I understand; but did you then  
16 go on to make specific recommendations as to how, when  
17 and what procedure should be followed at that crossing?

18 MR. MARSHALL: Mr. Commissioner,  
19 my recollection was that Mr. Anthony wasn't here that  
20 week but we exhausted this subject, I believe, several  
21 times, in that there is going to be a drilling program,  
22 if it's found that the aquifer would be blocked and  
23 the flow of water to the spring would be affected,  
24 then something will have to be done and the steps  
25 that could be taken were discussed by Doctors Harlan  
26 and Dr. McCart, I think in some detail. If it turns  
27 out there's no problem, then obviously nothing will be  
28 done. I really don't think the witness should have to  
29 go through it again and again.

30 MR. ANTHONY: Well, I've reviewed



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1 the evidence of that week, Mr. Marshall, and I'm aware  
2 of the evidence that was being led. I'm asking much  
3 more specific questions, and that was were there  
4 specific recommendations that were made to the engineers  
5 about that crossing, and what were those recommendations.  
6 The discussion is really, that took place, and the dis-  
7 cussion we've had so far on the crossing is an identi-  
8 fication of general concerns, and I appreciate that and  
9 I understand that. I'm saying now, having identified  
10 those concerns, and identified the potential problems,  
11 what did you recommend to ensure that these problems  
12 don't occur and so on?

13 A We have identified  
14 one potential problem, if in fact it can be demonstrated  
15 that there is sub-surface flow there which is part of  
16 the aquifer, feeding that spring downstream. We don't  
17 see the crossing as any problem at all. It's going to  
18 occur in winter. There is no water above the surface  
19 on any of the visits we've made to the site. We have  
20 told them that they should in fact investigate the  
21 area, and if there is sub-surface flow they are going to  
22 have to take the appropriate steps to ensure that it  
23 does not shut off flow into that spring. Now what  
24 those steps are, that's an engineering problem.  
25 We certainly have identified it as a problem. Everybody  
26 is aware of it. It's in the record a number of times  
27 here for this Inquiry, and this is there, this is the  
28 problem. Other than that I don't see any problems with  
29 the site. It's a potential problem, it hasn't been  
30 investigated in detail yet.



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1 But other than that it's just a normal stream crossing.

2 Q Well, let me approach  
3 this a little differently then. I will refer you  
4 to your Biological Report series, Chapter 4, page 24,  
5 25, Volume 15 -- sorry, this is Volume 15 of the  
6 Biological Report series, Chapter 5. O. K. now, on  
7 that volume and on those pages you outline a series  
8 of general guidelines concerning the routing and  
9 construction of a gas pipeline.

10 A Chapter 4?

11 Q This is Chapter 4, page  
12 24-25 and 26.

13 A

14 "Guidelines to reduce sedimentation"?

15 Q Yes, and you have outlined  
16 there a series of 12 guidelines that should be followed  
17 to ensure that sedimentation is not a problem, and I  
18 would gather Mr. Hemstock, these general guidelines  
19 are acceptable and have been accepted by Arctic Gas.

20 WITNESS HEMSTOCK: Yes.

21 Q O.K., and you state there  
22 in the very first paragraph:

23 "The following general guidelines have been  
24 followed in making specific recommendations  
25 to engineers concerning the routing and con-  
26 struction of the gas pipeline."

27 Could you tell me what, in any instance, ~~what~~ the specific  
28 recommendations that you refer to here, concerning  
29 the routing and construction, what they are and where  
30 they are?



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1 A Our recommendations are  
2 included as part of the alignment sheets, there are  
3 recommendations on there as to sensitivity, should do  
4 this, should do that, should not place gravel pits  
5 in the active flood plain of Rapid Creek was one that  
6 was brought up in Panel 2, there are specific recommen-  
7 dations in each of the stream catalogues where we have  
8 assessed the stream as a potential producer of fish,  
9 identified critical areas, and made some recommendations.  
10 In addition to that, of course, we have commented on  
11 a variety of structures and so forth, comments on the  
12 placement of communications towers, etc. etc. etc.  
13 These are the guidelines that we have in mind when we  
14 made specific recommendations.

15 Q Did you ever bring these  
16 specific recommendations together at a site specific  
17 situation?

18 A In the sense that I go  
19 through this whole list of guidelines, here and check  
20 them off, no, we don't use that procedure, no. These  
21 are the things that we keep in mind.

22 Q You've got a series of  
23 guidelines in mind that are obviously accepted by  
24 Arctic Gas. Now how did you convey this? Is it just  
25 a matter of general conversation, or did you not  
26 bring them down and say, "At this particular location.. "

27 A Arctic Gas has copies  
28 of this thing. They have read my general guidelines.  
29 Presumably they have them in mind when they are, you  
30 know, engineering these structures, and certainly if



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1 we don't like what they have done we tell them this.

2 Q But you did not, as part  
3 of your studies and the researching as I've gone through  
4 this volume and other volumes, I did not see at any  
5 stage where you've gone through and said, "We've  
6 studied it, we've looked at it, here are our recommen-  
7 dations."

8 A That isn't research, you  
9 know. That is what you come up with as a result of  
10 your research. You refine your guidelines. You can  
11 apply the guidelines in site specific situations but  
12 that isn't research. We don't sit down and write a  
13 long treatise on how we have applied guidelines to  
14 specific sites. We do in fact apply these guidelines  
15 to specific sites, but we don't sit down and write  
16 research volumes on these kind of things.

17 Q O.K., and what we have  
18 here is a research, and I appreciate that, but then how  
19 do you get it from that stage to the recommendation  
20 stage where you actually tell them?

21 A Well, we go to a meeting  
22 and we tell them, or we write them a letter and we  
23 tell them.

24 Q I see, and your projects  
25 that we have outlined here which do not have this  
26 step in them, it was the Biological Report series that  
27 did the research and --

28 MR. MARSHALL: Excuse me, Mr.  
29 Anthony. The comments are in the stream catalogue and  
30 they are on the alignment sheets, and those are Dr.



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1 McCart's comments on the alignment sheets on a site  
2 specific basis.

3 MR. ANTHONY: That is not  
4 entirely the picture, Mr. Commissioner. We have here  
5 even in Volume 16, which is an identification of  
6 critical areas, and we've discussed how we identified  
7 and what he means by critical areas. That's what  
8 it says, it says:

9 "Vermilion Creek, these are the potential  
10 problems."

11 It doesn't say, "Your pipeline crossing should  
12 therefore, you know, incorporate these sorts of  
13 recommendations or these sorts of techniques or these  
14 sorts of protective measures." It merely identifies  
15 a concern but it doesn't have the recommendation, and  
16 I'm wondering if there were any recommendations.  
17 Of course if there were, that's obviously what we're  
18 most concerned with here.

19 A I mean we have meetings.  
20 We're not operating off at some great distance. We  
21 tell them, we have meetings with them. We discuss  
22 particular problems. I'm sure they're bored with  
23 hearing about sedimentation.

24 Q Did you ever write up  
25 any recommendations for Arctic Gas?

26 A Well, there's a list  
27 of recommendations in this chapter, that's what these  
28 are, guidelines.

29 Q Well, these are --

30 A Are you talking about



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1 specific recommendations?

2 Q Yes.

3 A For specific sites?

4 In some instances we do and in some instances we don't.  
5 If we feel that the general erosion control measures  
6 and so forth that N.E.S. has defined would be adequate  
7 in those particular areas.

8 Q All right, I really  
9 am interested in knowing what your specific recommen-  
10 dations were, those that you did do. Now are they  
11 in the form of a report or any way that we can look at  
12 the recommendation and say, "Now McCart has recommended  
13 that and he knows."

14 A In some instances they  
15 are in the form of a report and in some instances  
16 they are simply verbal communications.

17 Q Now when you say that in  
18 some instances they are in terms of a formal report,  
19 where --

20 A Well, in some instances  
21 they are included in this Volume 16, and in some  
22 instances they may be recommendations in the Biological  
23 Report series. There are certainly recommendations  
24 about specific transmitter site locations in my files,  
25 but we don't want to generate any more paper than we  
26 have to. We already have a mountain of this stuff to  
27 deal with.

28 Q Your recommendations, so  
29 I understand it accurately, are what are found in the  
30



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1 Biological Report series. This is the only place you  
2 put it on paper and you said, "Here are my recommen-  
3 dations."

4 A Our recommendations in  
5 the Biological Report series of course tend to be  
6 general ones. In addition to that there are site  
7 specific recommendations on the alignment sheets. We've  
8 had verbal communications, and on innumeral occasions  
9 including a meeting back in 1973, was it, we discussed  
10 these things at great length and you have a copy of the  
11 comments -- an edited copy, I might add -- in the sense  
12 that there were a lot more discussion than is included  
13 in those, and all of these things of course contribute  
14 to the final configuration of the pipeline.

15 Q You see my concern,  
16 Dr. McCart.

17 A I see your concern, and  
18 certainly we have had a great deal of input into the  
19 configuration of this pipeline, and we have certainly  
20 made a great number of recommendations both site  
21 specific and general.

22 Q And that's really what  
23 I'm attempting to assess, are those recommendations, and  
24 I find as we go through the Biological Report series  
25 in Volume 16 that they don't provide us with specific  
26 recommendations. They identify the problem and they  
27 give guidelines, but they don't say, "What does Dr.  
28 McCart suggest you do to deal with those problems."

29 THE COMMISSIONER: No, he says  
30 that that is something he may have said at a meeting



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 he's had with them, or that he may have told them over  
2 the phone or by memorandum, but it hasn't been organized  
3 in the form of a report that would be appropriate to  
4 be located and produced here. I don't see how you can  
5 really expect to get any farther along this line. Surely  
6 what's important is, what guidelines has he laid down  
7 in the Biological Report series? Are they sound? If  
8 you want to challenge them, you should, and if your  
9 witnesses intend to challenge them you should put their  
10 point of view to Dr. McCart so that he can deal with it.  
11 But I think you've gotten as much change out of him  
12 as you're going so far as his methodology or whatever  
13 they call it is concerned.  
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Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1  
2 Q I wasn't concentrating  
3 on the methodology, I was trying to assist the Inquiry  
4 and us in understanding what recommendations we should  
5 make, and we have one of the most knowledgeable  
6 gentlemen, because he's been working in the field  
7 and dealing with these problems, and I was trying to  
8 determine where the recommendations were, the sorts of  
9 recommendations that this Inquiry has to make, and the  
10 guidelines, you're right, sir, but if you refer to  
11 them, they're in terms of,

12 "Every effort should be made to minimize contact  
13 between water bodies and pipeline right-of-way."  
14 Well, that's very fine.

15 A No, but then it goes  
16 on, doesn't it,

17 "Eliminate stream crossings."  
18 We've done this as much as possible.

19 "Eliminate close parallels with streams."

20 Q Let's deal with a  
21 specific and then you can indicate whether you have  
22 formed any recommendations and then, in a particular.  
23 No. 8:

24 "Pipeline construction should be closely  
25 monitored so that any unacceptable level  
26 of siltation is immediately identified."  
27 Well, let's not get into "unacceptable level of  
28 siltation", but what do you mean by "monitoring"?  
29 What sort of recommendations have you made in that --  
30 to fulfil that guideline?



Banfield, Gunn, Hemstock  
McC art, Jakimchuk  
CrossExam by Anthony

1  
2 A Well, I think that we made  
3 a general recommendation re monitoring, and Mr. Hemstock  
4 has outlined how it's to be done.

5 Q Yes, but have you not  
6 indicated<sup>in</sup> any more specific terms the type of monitoring  
7 program you suggest? Let me give you an example. I'll  
8 ask you to comment on this. Mr. Brian is part of  
9 the environmental social program, E.S.P. 73.6 suggests  
10 the following:

11 "Attempts to be made to develop standards for  
12 suspended sediment level during and after  
13 construction."

14 Sorry, I've got the wrong section. I've got the  
15 wrong reference here, but let me put it in this terms,  
16 as I understand it, the suggestion by Dr. Stein for  
17 example, on one of the E.S.P. studies he has done  
18 suggests that following installation of a water  
19 crossing there should be weekly monitoring for at least  
20 one month following breakup, then monthly monitoring  
21 for the first year, and then thereafter a quarterly  
22 until stabilization has occurred and so on. Now he's  
23 attempted to fill in your guidelines by saying  
24 adequate monitoring by saying, "That's the sort of  
25 recommendation that should come forth, that you should  
26 have weekly inspections from the time during breakup  
27 or the first month after breakup." Now, you've got  
28 experience in the area and I'm trying to determine  
29 what your recommendations would be of an adequate  
30 monitoring program, to fulfil a guideline that you  
say you wish to apply.



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 A Well, we have not yet  
2 sat down and decided. I have not made any specific  
3 recommendations as to that kind of thing.

4 THE COMMISSIONER: Do you have  
5 any comment on that proposal of Stein's?

6 A Well, I would say that  
7 in some areas of high instability you might want to  
8 go more than weekly immediately after. In general it  
9 sounds O.K. to me. It may in fact, stability may  
10 occur, or you may have a stable situation long  
11 before the, I think, two years total interval that  
12 he's talking about, and I would suggest that you  
13 could terminate it as soon as, you know, you're  
14 reasonably sure that stabilization had occurred. The  
15 other thing is that I don't see any point in going  
16 monthly during the course of the winter because after  
17 freezeup has occurred you're not going to get erosion  
18 down rights-of-way and things of this sort, so that  
19 I would want to modify that possibly.

20 That sort of thing might be  
21 all right during the open water season when water is  
22 flowing.

23 MR. ANTHONY: You see, that's  
24 the sort of thing, Mr. Commissioner, the reason I  
25 brought the issue up, the sort of approach and the  
26 sort of recommendation I'm looking at. If he hasn't  
27 given consideration to these issues then, and made  
28 those specific recommendations I guess we have to  
29 stop there.  
30



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1  
2 Q Dr. McCart, in your  
3 section on the obstruction of this fish passage, page  
4 22 following, I'm not going to refer to a specific  
5 passage but I would imagine that to start with you  
6 would need data on the swimming performance of the  
7 various species that you will be concerned with in  
8 order to make any conclusion as to their ability to  
9 navigate any particular velocity of water or any  
10 particular crossing. You would agree with that?

11 A Yes, yes.

12 Q Now, have you now  
13 experimental evidence on the swimming performance of  
14 the various species that will be encountered?

15 A The government funded  
16 a study of the swimming performance of a large number  
17 of species that occur in the Mackenzie Valley, and this  
18 has been published in the Journal of the Fisheries  
19 Research Board of Canada, so the information is  
20 available. I think with the possible exception of  
21 Arctic char, but to a considerable extent you can  
22 extrapolate swimming performance from one species to  
23 another.

24 Q And you've referred to  
25 that particular study and it's your opinion that  
26 you're able to extrapolate with respect to char.  
27 Is that the basis --

28 A I don't think that char  
29 were included in it. Certainly grayling, one of the  
30 important migratory species, is, but I see no difficulty



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 in extrapolating from data for assumed performance of  
2 other species. There are general mathematical relation-  
3 ships which relate the swimming performance to the length  
4 of the fish which seem to be true for a wide range  
5 of species.

6 Q Let me get your view on  
7 another suggested technique or method of recommendation.  
8 That is really the question of how do you deal with  
9 the problem of suspended soils or siltation, and I'd  
10 like to then quote to you an attempt to deal with this  
11 problem and get your assessment as to whether or not  
12 this would be a sound method of proceeding. I refer  
13 you to Brian's E.S.P. article 73.6, and there's just  
14 one paragraph which I will read.

15 MR. MARSHALL: Excuse me, what's  
16 an E.S.B. article?

17 MR. ANTHONY: Environmental  
18 Social Program.

19 MR. MARSHALL: Program, oh, P.

20 MR. ANTHONY: That's E.S.P.,  
21 Environmental Social Program, Volume 73.6, page 50.

22 THE COMMISSIONER: That's not  
23 how they did the work, though.

24 MR. ANTHONY: He has to say  
25 there as follows:

26 "Attempts should be made to develop standards  
27 for suspended sediment levels during and  
28 after construction. The standards would be  
29 based on bioassay experiments that might be  
30 different for different seasons of operation.



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1  
2 The standards for different crossings might  
3 vary depending upon the fish species and  
4 habitats which would be affected. During  
5 construction changes in procedure may be  
6 necessary in order to meet the standards.  
7 After completion of the pipeline additional  
8 erosion control features may be required to  
9 meet the standards."

10 Now, was he suggesting a bioassay set of standards before  
11 you start working, monitor it, and then provide a  
12 minimum and maximum standard. This is a recommendation  
13 of how to deal with the problem of river crossings.  
14 I'd like just to have your opinion on this method.

15 A The obvious difficulty is  
16 determining what the standards should be. You know,  
17 you can classify streams along the North Slope in three  
18 major classifications. Dr. Craig and myself have done  
19 this in a paper, and you could possibly define  
20 standards for each of these three major classifications.  
21 Then you're always going to have individual exceptions.  
22 Look at the Mackenzie River where four and 500 parts  
23 per million suspended sediments are relatively common,  
24 and compare that with the Peel River which is also  
25 relatively turbid, and compare that with the Firth,  
26 which for a period of the year at least is turbid and  
27 for a period of the year is clear. Compare that with  
28 the Great Bear River, which runs relatively clear  
29 throughout the year. It's very difficult to see how  
30 you could come up with a single standard which you



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 could apply to all of this great variety of streams.  
2 The other difficulty of course is what bioassays are  
3 you going to use?

4 Q Well, I didn't want to  
5 suggest that there would be only a few standards. I  
6 think in fact Brian suggests that there would have to  
7 be a number of standards for a number of seasons,  
8 depending on the species, the season, the method of  
9 construction and so on. But he is suggesting that  
10 people like yourself, go to a particular location and  
11 do a study and set a standard which is then the standard  
12 that the engineers and the fellows driving the tractor  
13 and everybody who comes after you have to monitor and  
14 live up to. Now, would you recommend that that procedure  
15 be adopted as a method of protecting fish resources?

16 A You see, I'm not certain  
17 that that method would in fact protect the fish  
18 resources, because we might set a standard which would  
19 protect a large number of -- first of all, you see, if  
20 you're going to protect fish resources you've got to  
21 be assured that there is in fact a fish resource there  
22 to be protected. Is there a critical area in the vicinity  
23 which might be affected?

24 Q We found it.

25 A So we have defined that.  
26 Or is it a feeding area which might be used later in the  
27 year which might be affected, so there might be an  
28 indirect effect because you've affected the bentic  
29 and vertebrate population. So I would be concerned  
30



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 first, let's find out is it utilized by fish and what  
2 seasons of the year is any sediment that's produced  
3 likely to have, an effect that would continue beyond  
4 spring freshet after the year of construction, after  
5 the winter of construction? If there is no likelihood  
6 or very little likelihood that the fish populations  
7 will be affected, or that there will be any significant  
8 affect in a statistical sense, in other words can we  
9 measure it and show that there has been a significant  
10 change in the population, if it's unlikely that we  
11 would be able to detect any <sup>or</sup> change, /that there will  
12 be any change, why worry about it?



Banfield, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 It is only a temporary  
3 phenomena. When we come to an area where there are  
4 ctirical areas, those locations where there are critical  
5 areas, I think that you have to make every effort to  
6 minimize any chance of sedimentation.

7 Q I am with you there. Let's  
8 start with the assumption--

9 A It's a site specific thing.  
10 Now what Brian is saying, of course, he is making a  
11 very general statement. He just attacked me for making  
12 these kinds of general guidelines. That is a kind of  
13 a general guideline and suggestion and you can make  
14 these suggestions but how, in what practical manner  
15 are you going to carry this out?

16 Are you going to look at  
17 paraphyton(?) populations? What kind of a bio-assay  
18 would give you an immediate reading or a very short  
19 term reading on the effects of that siltation?

20 Q All right. Let's start  
21 off with the assumptions rather than finessing it with  
22 the idea of, well there may not be a problem. Let's  
23 start with the basis that there is a fish population  
24 you want to protect and let's assume also that siltation  
25 is a potential problem.

26 How your advice to us and your  
27 recommendations are that you did it on a site specific  
28 basis. You consider the situations and on site specific  
29 basis. And I am assuming that therefore your going  
30 to, as part of the final design process, go out and do



Banfield, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 this sort of site specific assessment. Now having done  
3 that, how do you ensure that that, that nothing goes  
4 wrong. I mean what do you do? Do you not have to  
5 indicate to the engineers and the people who are coming  
6 behind you, what conditions have to exist throughout  
7 or are you going to stay there and monitor it on a  
8 day to day basis?

9 A What we are going to do is  
10 we'll go to the site, if we feel that there might be  
11 water flowing during the course of the winter, we are  
12 going to suggest that these, this is an area where you  
13 have to take great care and that you might consider  
14 culverting if it is appropriate in the winter, and  
15 there is some question about whether you can use this  
16 technique in the winter, the provision of settling  
17 basins to restrict the downstream movement of materials.  
18 Those would be the kinds of recommendations we would  
19 want to make.

20 Q Right. And the reason your  
21 making these recommendations is to ensure that there  
22 is not a dangerous level of sedimentation. Now, what  
23 I am leaving with you and what I am asking you is,  
24 if your satisfied that there could be a dangerous level  
25 of sedimentation, how do you indicate to the people  
26 who are going to be/actually doing the work, when they are  
27 reaching the dangerous level?

28 A Well, I think I would, you  
29 would have to have a competent man on the scene.

30 Q Well, do you then intend to



Banfield, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1 and

2 / recommend that there be a competent man at each river  
3 crossing throughout the construction of that river  
4 crossing?

5 A I think that there has to  
6 be an environmental inspector on who would investigate  
7 what is happening at each river crossing, yes.

8 Q During the time of  
9 construction?

10 A Yes.

11 Q And you have made that  
12 recommendation to Arctic Gas and this is the way you  
13 do the sort of site specific work that you suggested?

14 A We have recommended that  
15 there be a competent fisheries biologist or man who can  
16 assess the fisheries and water quality aspects of  
17 construction along as part of the inspection team, yes.

18 THE COMMISSIONER: Excuse me.  
19 Would you mind repeating that? You said that the  
20 competent fisheries biologist--

21 A A competent, yes sir.

22 THE COMMISSIONER: And what  
23 was the "and what"?

24 A I don't know. Let's see  
25 what did I say? Or someone who would be competent,  
26 either a fisheries biologist or someone who would be  
27 competent to assess the effects on water quality.

28 THE COMMISSIONER: I thought  
29 you had an "and", instead of an "or" there and I  
30 wondered how many people are part of this thing.



Banfield, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 MR. ANTHONY: And this Mr.  
3 Hemstock is the method that Arctic Gas proposes to use  
4 to implement the protective measures that Dr. McCart  
5 has referred to?

6 WITNESS HEMSTOCK: Yes.

7 MR. ANTHONY: What happens on  
8 the construction site if this competent biologist  
9 indicates that the sedimentation level is getting  
10 dangerously high? Does he then have the authority to  
11 amend the construction procedure or close down the  
12 operation or--?

13 A He would report directly  
14 to the manager of that particular spread and indicate  
15 what his concerns are and they would mutually try and  
16 work out a means of alleviating the problem. If they  
17 couldn't agree, he has direct access to director of  
18 environmental studies.

19 Q That's you at the moment  
20 isn't it?

21 A At the moment yes.

22 THE COMMISSIONER: And no  
23 doubt will continue to be so.

24 A I may be retired before I  
25 get to that stage. And I would, of course, have access  
26 to people like Dr. McCart and we would then have the  
27 option of shutting the operating down or changing the  
28 operation to the satisfactory approach.

29 Q Dr. McCart to deal then  
30 with another specific issue and--



Banfield, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

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THE COMMISSIONER: Excuse me.

Theres an interesting question here. I don't-- It occurs to me that maybe all of you have thought of it but, and I would be interested to know how they dealt with it in Alaska because there of course, the company has its own environmental inspectors and the Alaska Pipeline Office has its environmental inspectors and they have a close working relationship as I understand it.

Now, let's suppose, and I am not asking anyone to answer this now but you might all think about it, let's suppose that somebody from the North Slope, an environmental inspector, this competent fisheries biologist that Dr. McCart has provided, says you have to shut this down, the spread manager says no or may well be inclined to say, <sup>no,</sup> he will no doubt be an engineer or a construction man and not a fisheries man and they go to you, that is the environmental inspector goes to you and presumably the spread manager can go above your head I suppose, and at the top of this pyramid is Mr. Horte at the moment. Now what would be the ethics of the fisheries biologist saying to hell with all of you and going to the regulatory authority in Alaska, it would be the Alaska Pipeline Office, we don't know what shape the thing would take in Canada, but let's suppose you went to the environmental inspector, employed by the regulatory agency that are supervising the construction of this pipeline? Is there anything wrong with that ethically from the point of view of the



Banfield, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 fisheries biologist. Is his first duty to the  
3 environment as he conceives or to his employer.

4 And secondly, what would the  
5 attitude of Arctic Gas be towards that? And finally  
6 there <sup>the</sup> is question. What powers do the environmental  
7 inspector employed by the regulatory agency have?  
8 Well, I am not asking anybody to wrestle with that  
9 now but--

10 WITNESS HEMSTOCK: I might  
11 comment that I see nothing at all wrong with him, in  
12 fact, <sup>I would expect</sup> that he work very closely with the government  
13 inspector on the job.

14 Really, the job of the inspector  
15 is to foresee these problems ahead of time and make  
16 sure that we don't get into those kind of situations.  
17 That to me, the essential role of the inspector  
18 is to be ahead of the construction, to point out these  
19 problems ahead of time and make sure that the construc-  
20 tion goes without hitch.

21 Now, obviously, occasionally  
22 they are going to get into these type of situations.  
23 But I would expect that he work very closely with the  
24 government inspector. In fact, there would be a man  
25 on the spread with part of his job as liaison with the  
26 government inspection team or whatever group there might  
27 be.

28 MR. ANTHONY: Dr. McCart ,  
29 did I detect a desire to leap into the fray?

30 WITNESS MCCART: Well, I was



Banfield, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 just going to say one of the reasons that I like to use  
3 the work competent is so that we have a man who can talk  
4 intelligently with the, with his counterpart on the  
5 government regulatory team.

6 Q Would you anticipate that  
7 the, this counterpart of the government/<sup>team</sup>would have,  
8 would also be--

9 MR. MARSHALL: He would un-  
10 doubtedly be competent.

11 Q Who undoubtedly be competent.  
12 Right. Would you anticipate that this very competent  
13 person would be involved in the final design process?  
14 In other words, as you come to the place of deciding  
15 what your going to do?

16 A Well, he may or he may not.

17 Q What is your recommendation.

18 A I don't think it makes a--  
19 Well, it would be advantageous obviously if he had have  
20 been involved in the final design, yes, and he had  
21 inspected each of these things prior to the construction.

22 Q Now, in response to some  
23 questions about the site specific studies that have  
24 been done and a number of river crossings that have  
25 been examined there was a figure given as a number as  
26 the number examined and we had when we were discussing  
27 borrow sites, the concept of sort of a development plan  
28 for each borrow site which would indicate what your  
29 going to do, how your going to do it, when your going  
30 to do it and what it is going to look like when your



Banfield, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 finished. Now, would you recommend such a development  
3 plan for each particular crossing as well?

4 A Well, this was discussed  
5 I think in the panel two testimony at some length.

6 Mr. Williams discussed this and in some instances  
7 we would want to be part of it and in some instances  
8 no. A lot of crossings are minor crossings of  
9 little consequence to fish populations or femoral  
10 streams and things of this sort.

11 Q But, you/anticipate the  
12 process of putting together all your, all the factors  
13 to be taken into account at river crossings and submitting  
14 that for approval before the river crossing--?

15 A We would make recommendations  
16 concerning those crossings where we felt that, in fact  
17 already have to some extent, but in the final design  
18 stage we would make further recommendations regarding  
19 particular stream crossings where we felt there might  
20 be some implications for fish populations.

21 Q When your doing that and  
22 when your communicating to your fellow competent  
23 biologist within the government who has to approve your  
24 plans for a particular location, are you not going  
25 to have to give him an indication of the sorts of  
26 sediment levels that you feel are appropriate or  
27 tolerable in that stream and so on?

28 MR. MARSHALL: Excuse me,  
29 Mr. Anthony. You know how I hate to interrupt. Your  
30 suggesting that there will be a competent government



Banfield, Gunn, Hemstock,  
Jakimchuk, McCart.  
Cross-Exam by Anthony.

1  
2 fisheries biologist who will be approving the river  
3 crossing plan? Are we talking about regulatory authority  
4 to be established or one that has already established  
5 or are you, is this something your going to urge on the  
6 Inquiry?

7 MR. ANTHONY: Well, I am not  
8 dealing with that specifically. I am merely taking  
9 up the suggestion that Dr. McCart made, that whoever  
10 this other party may be, whether it is a pipeline  
11 authority, the current fisheries biologist of the area  
12 or whatever and picking up this idea of the particular  
13 river crossing and what is going to take place at the  
14 crossing and I am merely asking whether you are going  
15 to also have to as part of that development plan,  
16 provide specifics/<sup>as</sup>to sediment level and all these sorts  
17 of standards that you say are almost impossible to set.  
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Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

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4 MR. MARSHALL: What is going to  
5 be required is going to be a question of what the  
6 regulatory authority establishes as being necessary.

7 MR. ANTHONY: I appreciate that.  
8 I think that Dr. McCart is certainly able to give his  
9 recommendation as to how this thing should be run, to  
10 ensure protection of the fisheries, and I'm sure that's  
11 his goal in all this, is to ensure protection of the  
12 fisheries, and I'm just anxious to know what recommenda-  
13 tions and what mechanisms he feels would ensure protec-  
14 tion of the fisheries.

15 A Are you asking me whether  
16 I would come up with quantitative standards for suspended  
17 sediment levels, bed load and this kind of thing?

18 Q Yes,

19 A I think that's an impos-  
20 sible task, in the sense that we don't know what  
21 characteristics of the silts are, the fines and the  
22 beds in particular rivers, how far they're going to be  
23 suspended, whether they're going to settle out. I  
24 don't think that we can use that kind of quantitative  
25 approach unless we do very, very site specific work  
26 and we take cores and do gravel sieve analysis for  
27 each crossing, then we have to look at, you know, what  
28 we would set as a maximum suspended sediment load for  
29 each crossing. I think that's a very impractical approach.

30 Q And you would not



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 recommend that these sorts of things be done before  
2 approval is granted for particular river crossings?

3 A No. I would say that  
4 if we're going to set -- it's going to be extremely  
5 difficult to set any kind of quantitative limit which  
6 would apply to a wide range of streams.

7 Q Well, if I'm a regulatory  
8 officer, and you come to me with the proposal of Arctic  
9 Gas to cross particular streams, how am I to know whether  
10 what you propose to do is going to adequately protect  
11 the fish, which is our mutual goal? Don't you have  
12 to do these sorts of studies and get this sort of  
13 information and say, "Look, if I go in there and use  
14 these techniques, this is what's going to happen and  
15 it's not going to cause damage to the fish."

16 A I think you have to be assured  
17 that at each crossing every effort is made to keep the  
18 level of sedimentation to a minimum.

19 Q Yes, I'm with you there, and  
20 I, as the authority -- authorizing officer have to  
21 ensure that and I'm wanting to know what you'll give  
22 me that will allow me to assess whether or not --

23 A We will give you a plan  
24 for the crossing and indicate the facilities and the  
25 manner in which we're going to cross it, in order to  
26 assure you that they have taken every precaution. In  
27 some streams you're going to have high levels of  
28 sediments downstream simply because that's a character-  
29 istic of the bed. If you want to cross the stream  
30 at all you're going to have to tolerate very high levels.



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 Q But don't you also have  
2 to tell your officer what your assessment is of the  
3 amount of sediment that will be let out and so on,  
4 and the effects?

5 A Well, a hydrologist  
6 might be able to tell him what the carrying capacity  
7 of a stream might be at a certain time of year and  
8 how much of it might be carried downstream and so on  
9 and so forth, but I don't know that that is required  
10 for every stream, as part of a stream crossing plan.  
11 I do think it's essential, though, to demonstrate that  
12 you have taken every precaution and that the level of  
13 sedimentation in that particular crossing resulting  
14 from that particular crossing will be the minimum that  
15 you can achieve, in any kind of practical way.

16 Q O.K., having demonstrated  
17 that, do you have to -- would you suggest that it also  
18 demonstrates the impact of that minimum sedimentation  
19 that --

20 A How would you do that?

21 Q Well, I'm saying that  
22 that's what I'm asking you. If it's an impossible  
23 task --

24 A To do an impact  
25 assessment for every stream crossing?

26 Q Well, I'm dealing --

27 A In a sense we can in a  
28 very general way, we can say, "O.K., there are or not  
29 any critical areas for fish here so that the impact  
30 on fish populations will be minimal, if in fact it



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 will be detectable at all.

2 Q Well, that's probably an  
3 argument that will go on for some time.

4 THE COMMISSIONER: Let me just  
5 ask you, Dr. McCart, I think we have been told that  
6 there are 600 river and stream crossings north of 60,  
7 something like that. Arctic Gas say that they intend  
8 to design crossings for 150 specific rivers and streams  
9 in the Northwest Territories and the Yukon. I think  
10 six of those are major river crossings that we are all  
11 familiar with, so something like 145 of them are  
12 smaller rivers and streams where they think that they  
13 have to have a site specific design. Now that's a  
14 design prepared by engineers. Is it your understand-  
15 ing that those designs will be established on a basis  
16 of the guidelines that you've laid down? That's the  
17 extent of your involvement in those designs, that is  
18 not just your specific remarks on the alignment sheets,  
19 the guidelines that you've listed in the Biological  
20 Report series are there, and in other ways they have  
21 received your specific recommendations in regard to  
22 particular sites.

23 A Yes, and we would again  
24 look at these things. I think we have indicated in  
25 Phase 2 that there will be a statement for each cross-  
26 ing and it would include some environmental impact  
27 assessment, and we would be prepared to do this. You  
28 see, the difficulty that I'm having is that if you  
29 pick suspended sediments of all of the things that  
30 you can set quantitative criteria for, this is absolutely



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1 the most difficult one. I have no objection to setting  
2 quantitative limits for such things as methanol, I  
3 think that's<sup>a</sup> relatively easy problem; but when you're  
4 talking about suspended sediments, in one area you're  
5 talking about silt, and in another area you're talking  
6 about sands, and in another area you're talking about  
7 this, that, and another thing. You're talking about  
8 crossing streams of varying sizes, which have varying  
9 carrying capacities for silts. You're talking about  
10 areas in which there are critical areas downstream  
11 for fish populations and there are other  
12 areas where there are no fish within God knows how  
13 long a distance, and it seems to me an almost impossible  
14 task to set quantitative criteria that are going to be  
15 meaningful for a wide range of conditions. I think the  
16 best we can do is minimize it as much as possible by  
17 demonstrating that you have taken every precaution;  
18 that you are going to do this, you are going to use  
19 settling basins, you're going to use culverting tech-  
20 niques where appropriate, but to sit down and say,  
21 "Look you can't exceed 10 milligrams per litre at a  
22 distance, 10 milligrams per litre over background  
23 levels of a distance of 100 yards downstream of the  
24 crossing, or 200 yards, or half a mile." I think this  
25 is not terribly meaningful because it is not applicable  
26 over a wide range of conditions, and you're going to  
27 run into all manner of difficulty if you start  
28 setting this kind of quantitative criteria. You may  
29 find that without having done a lot of ditching experi-  
30 ments across streams that the criterion that you have



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McCart, Jakimchuk  
Cross-Exam by Anthony

1 set when you actually get out into the field  
2 means that you can't cross any stream in which there is  
3 flowing water. If you're going to set this kind of quan-  
4 titative criterion you're going to have to go out and  
5 do a large series of experiments to find out what  
6 happens when you ditch across streams, when you take  
7 no precautions, when you use no settling basins, when  
8 you use no culverts, as opposed to situations in which  
9 you do use these. Now those experiments themselves  
10 might do more damage than using whatever techniques  
11 are available to you and putting in settling basins  
12 as a matter of course, and so forth where you have  
13 flowing water, in the vicinity of crossing sites.

14 I have no objection to  
15 objective, quantitative criteria except that this is  
16 absolutely the most difficult thing to arrive at  
17 objective quantitative criteria for. That's the problem,  
18 as I see it.

19 MR. ANTHONY: I agree with  
20 you, and that's why I selected that particular problem,  
21 to discuss the problem, is that it is the most difficult.

22 MR. MARSHALL: Mr. Commissioner,  
23 just on the point that you were raising with Dr. McCart  
24 about his role in the process, having developed these  
25 various guidelines, as you mentioned, the hydrologists  
26 and river engineers would design those specific  
27 crossings. Dr. McCart would then be given an opportunity  
28 to review those crossings, as I understood the evidence  
29 from the last panel, and he could make whatever comments  
30 he felt were appropriate as to additional measures he



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 felt ought to be taken.

2 A That was my understanding  
3 also.

4 MR. ANTHONY: I propose now to  
5 turn to another subject.

6 THE COMMISSIONER: Fine, we'll  
7 adjourn for coffee.

8 (PROCEEDINGS ADJOURNED FOR FEW MINUTES)

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Banfield, Hemstock, Gunn, McCart  
Jakimchuk  
Cross-Exam by Anthony

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. MARSHALL: I spoke with Dr. Gunn at the break and he told me that he had put together in report form a summary of ornothological recommendations in regard to the proposed Arctic Gas pipeline and he has given me his copy of it.

This report had not been listed in the Arctic Gas list of reports and I don't -- it had not been listed in the items relied upon by the panel. I hadn't been aware that there was such a document.

It's, I understand, a dynamic document in the sense that it's something that Dr. Gunn keeps and up dates it as situation changes. And the copy he has given me which is his report library copy is dated March of 1975 and I understand that it is in some respects out of date and he hasn't had it revised since then.

This appears to be the sort of thing that my friend, Mr. Anthony, was attempting to get from Dr. McCart and I understand the report has been submitted to Arctic Gas so accordingly I'll have this copy photocopied and I'll have copies available for counsel so that they can look at it later in the day and hopefully they'll have sufficient time to prepare for <sup>any</sup> cross-examination they may have on it when they resume December 2.

MR. ANTHONY: Mr. Commissioner, it would assist me if I could have a copy that I could take away next week since I imagine I am first up.



Banfield, Hemstock, Gunn,  
McCart, Jakimchuk  
Cross-Exam by Anthony

1  
2 in the cross -- or after Mr. Gibbs. Sorry. In the  
3 cross-examination of the of Dr. Gunn and I am  
4 wondering if Mr. Marshall would agree to leave one  
5 here because there are counsel here who would like to  
6 use it and make another copy available.

7 My secretary will be  
8 down in a few minutes to pick it up to take it out for  
9 photocopying.

10 MR. ANTHONY: Q Dr.  
11 McCart, just a few short points. On page 24, you discuss  
12 the question of subsurface drainage and we've discussed  
13 that at some length. I don't propose to. I just wanted  
14 to get some locations down with you. You indicate there  
15 that you have identified a spring and with all the  
16 attendant possible difficulties between the Malcolm  
17 and the Firth, would you anticipate or have you  
18 discovered other streams and are you able to give us  
19 a little bit more definite locations?

20 WITNESS McCART: A Well,  
21 I think we covered this in Phase Two. There is a  
22 spring downstream of the crossing on Fish Creek.

23 Q That's the mouth of  
24 Fish Creek near Komakuk Beach?

25 A That's the one, yes.  
26 That's the minor spring. The largest spring on Fish  
27 Creek is upstream of the pipeline crossing. There is  
28 one on the east side of the Malcolm River. There is  
29 one between the Malcolm and Firth Rivers and there is  
30 one on the west side of the Firth River fan.



Banfield, Hemstock, Gunn,  
McCart, Jakimchuk  
Cross-Exam by Anthony

1  
2 Q You may have covered it  
3 in one of these. I'm not sure. Is there also one  
4 at the Spring River?

5 A I believe there is, yes  
6 the  
7 but we have little information on utilization of that  
8 one by fish. What I'm indicating is we don't feel that  
9 it is utilized to any great extent by fish.

10 Q Thank you. I would like  
11 to now to turn to the question of methanol and ask you  
12 to start, as a starter, whether you have in your research  
13 studied the behaviour of methanol in water as distinct  
14 from its effect on fish?

15 A No.

16 Q Do you know of any  
17 studies or have you referred to any studies which have  
18 enabled you to assess whether or not it disperses  
19 immediately or stays together and floats as a unit or --

20 A Well, it's highly  
21 soluble in water and the indications that we have are  
22 that it is readily vaporized from the surface of the  
23 water but we have not in fact looked at this in any  
24 great detail.

25 Q So for purposes of your  
26 study of methanol on fish, you have proceeded on the  
27 basis that it disperses quickly throughout and dissolves  
28 in the water relatively quickly.

29 A Yes. Ours were experi-  
30 mental studies and we simply dissolved a portion in  
the water. We know that, that there is considerable



Banfield, Hemstock, Gunn,  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 heat generated. Also during the course of the  
2 experiments we had to continuously add methanol in  
3 order to maintain the appropriate concentration because  
4 it was -- it did evaporate from the surface of the  
5 aquaria.  
6

7 Q You mentioned that the  
8 generation of heat. This is what I believe is called  
9 as the exothermic reaction, is it and am I right in  
10 my understanding that when methanol is added to water  
11 the energy is released in the form of heat when the  
12 two substances -- ?

13 A There is some heat  
14 generated, yes.

15 Q And am I also right in  
16 my understanding that in the case of a large methanol  
17 spill, this could cause what's called temperature shock  
18 and possible fish mortality?

19 A I suppose if the increase  
20 in temperature were that great but it seems to me that  
21 if there were sufficient methanol spilled to cause  
22 a really radical change in temperature that it would  
23 be the toxic effects of methanol which would take  
24 precedence over any exothermic, or sorry, thermal shock.

25 Q In your study of the  
26 effect of methanol which is found in the Biological  
27 Report Series, Volume 15, Chapter 5, you describe on  
28 pages 27 and 28 the results. Have you also studied  
29 the sub-lethal effect on fish?

30 A Well, generally we talk



Banfield, Hemstock, Gunn,  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 about acute toxicity in longer term toxicity. Our experi-  
2 ments were did exceed the usual 96-hour acute toxicity  
3 test. And in the case of the experiments with eggs  
4 and alevins, there were very much longer than this  
5 150 to 200 days. So in that sense, yes, we did study  
6 the sublethal effects in the sense that we looked at  
7 the longer term effects over a longer period of time  
8 on hatching, growth rates, hatching dates and growth  
9 rates. These were sublethal effects. They certainly  
10 weren't dead and there were detectible effects however  
11 at certain concentrations so we did, in fact, look at  
12 these.  
13

14 Q Could you tell us what  
15 some of the sublethal effects on small fish is of  
16 methanol?

17 A Well, what happened was  
18 that there was a shortening of the time to hatching from  
19 the egg and a reduction in the growth<sup>rate</sup> of the individual  
20 exposed to certain concentrations of methanol. In  
21 other words, at the time of hatching the fry from the  
22 eggs exposed to concentrations of methanol exceeding  
23 .01% was -- these were affected both in the growth rate  
24 and in the hatching time.

25 Q So there was an effect --  
26 was there also an effect on the fertilization success?

27 A Well, of course, as  
28 far as this report goes, we didn't cover that. It was  
29 indicated in the report that this was something that  
30 we had in fact not looked at. We're aware of it. It's



Banfield, Hemstock, Gunn,  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 discussed in the discussion. In fact we are doing  
2 experiments right now with chum salmon to  
3 determine whether in fact there is a detectable effect  
4 on fertilization success in this particular species  
5 which is common in the Porcupine drainage and those  
6 experiments are underway right now. We should have the  
7 initial results in another month or so.

8 Q And are you satisfied  
9 that as a result of the test that you currently are  
10 conducting you will be able to extrapolate the  
11 impact on char, grayling and other fish that -- ?

12 A Yes, I think that  
13 probably there won't be any great difference in the  
14 effects on sperm and fertilization.

15 We're looking at two  
16 things: the effect on sperm as opposed to eggs which  
17 have been exposed for a period of time. We're looking  
18 at both. We're trying to separate out the effect on  
19 sperm as opposed to the effect let's say on the  
20 covering of the egg whether it might be affected in  
21 the way.

22 We know that at 10%  
23 for instance the eggs don't survive at all. No ferti-  
24 lization occurs.

25 Q Besides this particular  
26 study, are you also conducting further studies or  
27 recommended further studies to study sublethal effect  
28 on fish themselves and their behaviour and -- ?

29 A No, not at this time.  
30



Banfield, Hemstock, Gunn,  
McCart, Jakimchuk  
Cross-Exam by Anthony

1  
2 We have recommended  
3 that tests be carried out with certain invertebrates,  
4 benthic invertebrates which might be important fish  
5 food..

6 Q Do you feel that these  
7 sorts of studies would be required to have a full  
8 understanding of the effect of methanol of fish?

9 A Well, we feel that if  
10 we can define criteria which will protect eggs and  
11 alevins, the developing young in the eggs -- that  
12 if we can define criteria which will protect these  
13 then we certainly are not concerned about the older  
14 fish which are more resistant we feel to the effects  
15 of methanol.

16 Q But do you not have to  
17 have an understanding of the effect on these fish  
18 in any event to understand the impact?

19 A Well, it -- of course,  
20 that -- you know, that never ends: How do you under-  
21 stand it? Do you understand it by looking at the  
22 physiology of the organism to find out precisely what  
23 happens? We're interested in the immediate effects of  
24 this thing and not so much in understanding it in  
25 great depth.

26 Q I'm advised that one of  
27 the possible effects of methanol on fish is that they  
28 turn, at least, temporarily blind. Is that -- are you  
29 familiar with that?

30 A They are and in fact,



Banfield, Hemstock, Gunn,  
McCart, Jakimchuk  
Cross-Exam by Anthony

1  
2 they do recover in many instances.

3 Q So they recover in many  
4 instances.

5 A Now, these are at  
6 fairly high concentrations. I might add.

7 Q But you haven't recom-  
8 mended any further study on this general problem. You  
9 are satisfied --

10 A No, our recommendation  
11 was that we should do further study on the effects on  
12 fertilization and we should also look at benthic  
13 invertebrates. We feel that we have a pretty good  
14 idea of what the concentrations that might be toxic to  
15 the most sensitive stages of fish life history might  
16 be and therefore we feel that having looked at the  
17 most sensitive stages it is not necessary for us  
18 to then look at stages in the life history which we  
19 suspect are far more tolerant of this kind of thing.

20 Q I believe your studies  
21 showed that the residue after evaporation of methanol  
22 would be .0003% and that's on page 36 of your report.  
23 And I am advised that testing agents used in actual  
24 pipeline testing would undoubtedly result in a higher  
25 residue and if this was so would you anticipate greater  
26 toxicity with higher residue?

27

28

29

30



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 A I haven't any idea of  
2 what the toxic effects of the residue is as opposed  
3 to the methanol itself.

4 Q Dr. McCart, again dealing  
5 with your methanol test on page 14, you state some  
6 conclusions and I'll read that to you, and get your  
7 opinion, you state at page 14:

8 "It must be stated in conclusion that the  
9 tolerance levels demonstrated here apply  
10 solely to a controlled laboratory testing  
11 procedure and cannot be directly applied to  
12 a field situation. The actual success of  
13 char, grayling or any species potentially  
14 exposed to methanol depends upon a complex  
15 and intricate matrix of environmental  
16 factors, including other species and  
17 physical factors which have not yet been  
18 tested."

19 That was your conclusion at that time. Is that still  
20 your opinion?

21 A Yes, certainly, but my  
22 feeling would be that the likelihood of toxic effects  
23 is probably reduced in the field in the sense that  
24 animals and fish in particular certainly respond to the  
25 presence of noxious chemicals in the water, but in a  
26 laboratory test situation are unable to do so.

27 Q I see, so you're basing  
28 this on just your educated opinion as a result of these  
29 sorts of tests that have been conducted or that you  
30 are presently conducting.



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 A We have not done tests  
2 in natural situations to find out what happens.

3 Q You also state on that  
4 page that:

5 "Exposure of spawning fish or developing eggs  
6 to any methanol concentration cannot be recommended."  
7 And I assume that also currently forms a recommendation  
8 of yours to Arctic Gas?

9 A Yes, we would recommend  
10 that methanol not be released in situations where  
11 spawning fish or their eggs were present.

12 Q Now earlier on in the  
13 engineering phase of the Inquiry the possibility was  
14 raised or at least discussed that maybe the possibility  
15 of warm water testing in certain crossings along the  
16 pipeline route. Have you any comment or any recomen-  
17 dations on how this testing should be carried out and  
18 the test you proposed? Or have you examined at  
19 all the effects of warm water testing on the --

20 A Oh yes, we've looked at  
21 this. We had two concerns. First of all, in warming  
22 the water there's a tendency, I think -- well, the  
23 solubility of oxygen is reduced at higher temperatures  
24 and so that there might be a reduction in the oxygen  
25 concentration of the water to some extent. Also of  
26 course there is this problem of temperature shock, and  
27 our recommendation would be that if warm water is  
28 used that at the time it's disposed of, which will be  
29 in late winter or during the course of the winter,  
30 that you know, precautions be taken to ensure that



Banfield, Gunn, Hemstock  
McCart, Jakimchuk  
Cross-Exam by Anthony

1 it was cooled and that re-oxygenated before it entered  
2 any natural waters.

3 MR. ANTHONY: Thank you. That's  
4 all the questions I have, Mr. Commissioner. Thank you,  
5 Dr. McCart.

6 MR. BAYLY: Mr. Commissioner,  
7 I understand that the afternoon is to be partially taken  
8 up by cross-examination by Mr. Gibbs of Mr. Dau, and  
9 what I'm going to suggest, sir, is that rather than  
10 break up my cross-examination into two portions that  
11 we break, as it is now an hour early for lunch, but  
12 perhaps come back at one o'clock to begin that. I would  
13 prefer, if everyone is agreeable, to start my cross-  
14 examination and finish it in one section, following  
15 Mr. Gibbs' cross-examination of Mr. Dau.

16 THE COMMISSIONER: And we will  
17 come back at one, Mr. Gibbs?

18 MR. GIBBS: Oh yes, I am  
19 ready to start Mr. Dau whenever he appears.

20 THE COMMISSIONER: Is he here?  
21 Is Mr. Dau here?

22 MR. MARSHALL: Mr. Taylor tells  
23 me he is.

24 THE COMMISSIONER: Well, if  
25 he doesn't mind coming down now, Mr. Gibbs could  
26 start now. Would that be all right?

27 MR. MARSHALL: I'll see if I  
28 can get him, sir.

29 (WITNESSES ASIDE)

30 (PROCEEDINGS ADJOURNED FOR FEW MINUTES)



P.H. Dau  
Cross-Exam by Gibbs

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

PHILLIP HARVEY DAU, resumed:

MR. MARSHALL: Mr. Gibbs

indicated that he wanted to make reference to two documents, sir, and they are at Mr. Workman's office and we're having them sent over, but Mr. Gibbs says he can start without them.

MR. GIBBS: I can start and if we get to a point where we need that document, why perhaps it would be appropriate to break off.

The documents that I will expect to be referring to in my cross-examination Mr Dau, sir, are Exhibit 287, which is a letter dated October 17, 1975 from my friend, Mr. Marshall to me containing the cost and breakdown which I had asked him at Whitehorse, or you had instructed at Whitehorse be produced, and attached to the letter are four sheets containing schematic diagrams and cost breakdowns.

THE COMMISSIONER: May I have Exhibit 287, Miss Hutchinson?

MR. GIBBS: As well, sir, I anticipate the probability that we will be referring to Exhibit 266, which is the volume which has become generally known as the cross-delta route amendment.

THE COMMISSIONER: And 266, Miss Hutchinson, while you're at it.

MR. GIBBS: And one more, sir, while she's there, Exhibit 59, which is the volume entitled:



P.H. Dau  
Cross-Exam by Gibbs

1 "Alternative corridors and systems of transportation."

2 The third one which I under-  
3 stand not to have been marked as an exhibit here, and  
4 I take it is the one that's being obtained from Mr.  
5 Workman's office, is a volume which has been filed in  
6 the National Energy Board, it's called:

7 "Amendment re size delivery lines,"  
8 and it relates to the changing of line sizes from  
9 Caroline on south to the 49th Parallel.

10 THE COMMISSIONER: Yes, well  
11 on the face of it you wouldn't expect that to be filed.

12 MR. GIBBS: No.

13  
14 CROSS-EXAMINATION BY MR. GIBBS:

15 Q Mr. Dau, you recall my  
16 asking you about costs on the Fairbanks corridor when  
17 we were in Whitehorse on August 11th, and that the  
18 exchange between us is contained in transcript Volume  
19 51.

20 A Yes sir.

21 Q And after being in White-  
22 horse and talking about this capital cost estimate,  
23 as you are aware Mr. Marshall forwarded to me what  
24 has now been marked here as Exhibit 287.

25 A Yes sir.

26 Q And you recall also that  
27 the substance of my questioning on these cost matters  
28 at Whitehorse was directed towards costs involved in  
29 a 48-inch pipeline from Prudhoe Bay along your Fairbanks  
30 corridor  
without a lateral to connect Mackenzie Delta gas.



P.H. Dau  
Cross-Exam by Gibbs

1 A Yes sir.

2 Q Then, sir, to start off  
3 can we first established some mileages on the Fairbanks  
4 corridor as compared to the prime route, and from -- I  
5 take this from your exhibit 287 and the schematic  
6 diagram with Exhibit 287 entitled:

7 "Fairbanks corridor."

8 A Yes sir.

9 Q In adding up those  
10 mileages and excluding the Mackenzie Delta connection,  
11 I come to a total of 2,125 miles.

12 A From where to where, sir?

13 Q From Prudhoe Bay to  
14 Caroline.

15 A Oh, that would be --

16 Q I explain, Mr. Dau, that  
17 I do that because after Caroline they are the same  
18 for either.

19 A I understand, sir.

20 THE COMMISSIONER: From Prudhoe  
21 Bay south to Caroline along the Alaska Highway to  
22 Whitehorse, and then through British Columbia and  
23 Alberta to Caroline.

24 MR. GIBBS: Yes, off the  
25 schematic diagram that would be segments 1, 2, 5, 6 and  
26 7.

27 A And what was the number,  
28 sir?

29 Q I added those up to 2,125  
30 miles.



P.H. Dau  
Cross-Exam by Gibbs

1 A Fine, sir.

2 Q And you agree with that?

3 A I haven't added them up.

4 I accept your arithmetic, sir.

5 Q And that is all, sir,  
6 48-inch pipeline

7 A Yes sir.

8 Q And out of that 2,125  
9 miles, when I subtract segment 1, I get in Canada  
10 1,380 miles.

11 A Yes sir.

12

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P. H. Dau  
Cross-Exam by Gibbs.

1

2

A Yes.

3

THE COMMISSIONER: That's

4

deducting Prudhoe Bay to Fairbanks and from Fairbanks  
to the Yukon border?

6

A Yes, sir.

7

MR. GIBBS: Then sir, would

8

other  
you look at the/schematic attached to Exhibit 287?

9

A Yes, sir.

10

Q Which is Arctic Gas's prime

11

route? Do you have that?

12

A Yes, sir.

13

Q And considering the portions

14

which would carry only Alaska gas, I added up those

15

portions and came to 1,797 miles. Will you agree with

16

that addition?

17

A That is the addition of

18

1, 2, 3, 5, and 6 sir.

19

Q 1, 2, 3, 5, and 6. Yes.

20

A And the number was sir?

21

Q 1, 779 miles.

22

A I am sorry.

23

Q I mean 1,797 miles.

24

A Would you mind going with

25

that again. I am sorry. I am not with you.

26

Q I thought to, because sir

27

I want to compare the costs of carrying the Alaska gas

28

I thought, on the prime route to determine the mileage

29

of only, of the portions carrying only, carrying

30

Alaska gas, whether along or alone, or co/<sup>mingled,</sup> and that is



P. H. Dau.  
Cross-Exam by Gibbs.

1  
2 an addition of the mileages under segments 1, 2, 3, 5  
3 and 6 which brings us to Caroline and those totals  
4 are determined to be 1,797 miles.

5 A Yes, sir.

6 Q And you agree with that Mr.  
7 Dau?

8 A As long as we don't quibble  
9 about a tenth of a mile, it is to the nearest mile,  
10 yes sir.

11 Q Yes, to the nearest mile.  
12 And that sir is all forty-eight inch line?

13 A Yes, sir.

14 Q And if I subtract from  
15 1,797 miles, the segment 1, I would have the mileage  
16 within Canada?

17 A Yes, sir.

18 Q And by doing that I determine  
19 the mileage within Canada, it would be 1,602 miles?

20 A That seems right sir, yes.

21 THE COMMISSIONER: I am awfully  
22 sorry but I am still not with you. The mileage from  
23 Prudhoe Bay to Caroline is 2,125 miles if you use  
24 the Fairbank's route, that is carrying purely American  
25 gas to the 49th parallel. Now I have understood that.  
26 Now--

27 A Then I--

28 THE COMMISSIONER: Do you  
29 mind going on from there.

30 Q Yes, sir. Then I ask the



P. H. Dau.  
Cross-Exam by Gibbs.

1  
2 witness to turn to the schematic diagram for the prime  
3 route which is attached to Exhibit 287, to determine  
4 how many miles of pipeline, on that route, would be  
5 carrying Alaska gas, excepting that some of it would  
6 be co-mingled.

7 And to do that one excludes  
8 the mileage from Richards Island and Parsons Lake to  
9 Travaillant Lake Junction so that that portion of the  
10 pipeline which Alaska gas within it will be segments  
11 1, 2, 3, 5, and 6.

12 THE COMMISSIONER: Sorry, this  
13 is where you --

14 MR. GIBBS: The second  
15 schematic.

16 THE COMMISSIONER: Oh, I see,  
17 yes. So this is the prime route?

18 MR. GIBBS: Yes, sir.

19 THE COMMISSIONER: So, if you  
20 exclude the Parsons Lake lateral and the Richards  
21 Island leg, you get 1,797?

22 MR. GIBBS: Yes, sir.

23 THE COMMISSIONER: And if you  
24 deduct from that, the Prudhoe Bay to the-- No, what  
25 was that?

26 MR. GIBBS: Segment 1, Prudhoe  
27 Bay to the Yukon boundary.

28 THE COMMISSIONER: And that is  
29 105?

30 MR. GIBBS: 195.



P. H. Dau.  
Cross-Exam by Gibbs.

1  
2 MR. GIBBS: 195, sorry.

3 And the result in miles in Canada is 1,602?  
4 THE COMMISSIONER:  
5 So, you get 1,602 on the  
6 prime route, Canadian mileage carrying American gas?

7 MR. GIBBS: Yes, sir.

8 THE COMMISSIONER: And on the  
9 Fairbanks route, you get 1,380 miles in Canada, Canadian  
10 miles carrying American gas?

11 MR. GIBBS: That's correct, sir.

12 THE COMMISSIONER: That's  
13 all right, I am with you. At least I understand you.  
14 I shouldn't say I am with you because I don't know  
15 where this is headed.

16 Q And to compare the comparison  
17 further, <sup>by</sup> the Fairbanks route, the total miles are  
18 2,125 and by the prime route, 1,797. That is to  
19 Prudhoe Bay.

20 Now, Mr. Dau the schematic  
21 does not contemplate the cross-delta route now adopted  
22 by Arctic Gas? Is that correct?

23 A That's correct sir.

24 Q But it is possible is it  
25 not Mr. Dau to calculate the difference in mileage  
26 because of the cross-delta route by referring to the  
27 Volume Exhibit 266, "Alaska supply lateral across the  
28 Mackenzie Delta"?

29 A Yes, sir.

30 Q And specifically it is done  
by referring and I don't propose to go through it unless



P. H. Dau.  
Cross-Exam by Gibbs.

1  
2 we have to, done by referring to the map under the tab  
3 8B, "Location of facilities"?

4 A Yes, sir.

5 Q And by going through the  
6 arithmetic involved with that map, it is my conclusion  
7 that in say, expressed in length of miles of right-of-  
8 way, by going across the cross-delta route you reduce  
9 the prime route mileage which would be carrying Alaska  
10 gas by 14.6 miles?

11 A I hoped we wouldn't have to  
12 go through it. My conclusion was that it was exactly  
13 the same distance.

14 Q Oh, well perhaps when we  
15 break I can go through it with you and tell you how  
16 I arrived at my 14.6 and perhaps we can take it at that  
17 for the moment until we correct it later.

18 And if you then add or subtract  
19 the 14.6 miles from the previous total mileage that I  
20 had to 1,797, you then come down by the cross-delta  
21 route to the total mileage from Prudhoe Bay carrying  
22 Alaskan gas of 1,782 miles?

23 A That's right.

24 Q But if we convert that to  
25 pipeline miles, then because you have two lines going  
26 across Shallow Bay, each  $36\frac{1}{2}$  miles in length, if we  
27 want to talk about pipeline miles we could increase it  
28 by 36 miles?

29 A That would be correct on  
30 pipeline miles sir.



P. H. Dau.  
Cross-Exam by Gibbs.

1  
2 Q Yes. And so if I add then  
3 the 36, I come on the cross-delta route for total mileage,  
4 carrying Alaska gas, of 1,818 miles.

5 A Yes, sir. Making allowance  
6 for the 14 miles that we seem to disagree on.

7 Q Yes. And it is rounded off.

8 A Of course.

9 Q And to determine the mileage  
10 in Canada again we just subtract the segment one--

11 A Yes, sir.

12 Q --and that would reduce the  
13 1,818 miles to the mileage within Canada being 1,623.

14 A Yes, sir.

15 Q Yes. And once, when we  
16 do that sir, we find that overall in pipeline miles,  
17 between Prudhoe Bay and Caroline, the Fairbanks route  
18 carrying Alaska gas, the Fairbanks route is 307/<sup>miles</sup>longer  
19 overall than the prime route across the delta.

20 A Well, again my number is  
21 328.

22 Q And that's, we are still--

23 A That's right.

24 Q --on the 14th. And but  
25 in Canada the Canadian mileage would be 243 miles less  
26 by the Fairbanks route than by the prime route of going  
27 across the delta?

28 A It would be less sir.

29 Q Well, sir will you confirm  
30 that the capital cost estimates included in Exhibit 287



P. H. Dau.  
Cross-Exam by Gibbs.

1  
2 are in 1974 dollars?

3 A Yes, sir.

4 Q And those capital cost  
5 estimates, I assume, are based upon the re-sizing of  
6 the delivery line south of Caroline, to a 36 inch line  
7 from Caroline to Kingsgate, a 48 inch line from Caroline  
8 to the Saskatchewan border, and a 42 inch line from the  
9 Saskatchewan border to Monchy.

10 A Yes, sir.

11 Q But those capital cost  
12 estimates are not however based on the cross-delta  
13 alternative which has now been adopted?

14 A No, sir. It is called the  
15 prime route before the cross-delta was adopted.  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30



P.H. Dau  
Cross-Exam by Gibbs

1  
2 Q At this point in time  
3 to get a comparable capital cost comparison, some revision  
4 is necessary for the cross-delta alternative.

5 A That would be correct,  
6 sir.

7 Q Also included in your  
8 capital costs in Exhibit 287 is a column called:  
9 "Escalated total or total escalated."

10 A Yes sir.

11 Q As near as I could  
12 determine, Mr. Dau, and perhaps you could confirm this,  
13 that total escalated is effective December 31, 1983,  
14 which is just prior to the year in which you expect  
15 the line to be operating at full capacity.

16 A That's not quite correct,  
17 sir. The escalated total, as we use it, is the  
18 1974 cost estimate escalated to the moment in time  
19 when you expend the funds, so it's not taking all of  
20 the dollars and escalating them to 1983, if that's  
21 what you were referring to.

22 Q No, I didn't intend that.  
23 I understand that you -- the escalation turns upon when  
24 you spend the dollars.

25 A I understand, sir.

26 Q I interpreted the column  
27 entitled:

28 "Total escalated"  
29 to mean that you would have expended all of your dollars  
30 and included in that were various items of escalation



P.H. Dau  
Cross-Exam by Gibbs

1 at December 31, 1983 or maybe before that just prior  
2 to the point you reached full throughput.

3 A I'm not sure of that.  
4 I'd have to look at the cost details in the exhibit, if  
5 that included the redesign south of Caroline. I'm not  
6 sure but what there aren't some compression costs that  
7 occur beyond 1983 that would be included.

8 THE COMMISSIONER: When you  
9 say "escalated costs", the Fairbanks route, the expendi-  
10 ture within Canada is 6,400,000,000 unescalated,  
11 8 billion escalated, that is within Canada. The prime  
12 route, that is the route along the North Coast and  
13 up the Mackenzie Valley is within Canada 5,600,000,000  
14 in 1974 dollars, and escalated it's \$7,167,000,000  
15 escalated. Is that a factor that takes inflation into  
16 account?

17 A Yes sir. If I could  
18 explain our cost estimates are prepared on quotations  
19 for material and labor rates and quotations for  
20 supplies and so on, at some particular moment in  
21 time. Arctic Gas have retained<sup>a</sup>/consultant to provide  
22 them with some, what I call escalators, that are percen-  
23 tage increases each and every year for some dozen or  
24 so classes of expenditure, like line pipe and compression  
25 equipment and labor and so on, and the computer program  
26 utilized to develop the capital costs, develops it  
27 first in 1974 dollars, and then takes into account when  
28 you spend the funds and the time frame, and then  
29 calculates what the expenditures would be, assuming those  
30 escalators were precisely correct.



P.H. Dau  
Cross-Exam by Gibbs

1 Q Well, one of the  
2 escalators then is a factor to take account of  
3 inflation?

4 A Yes sir.

5 Q Do you know if there's  
6 a given rate of inflation that was applied across the  
7 board for purposes of escalating the cost?

8 A No sir. I'm sure I  
9 don't have that here. I believe there were about a dozen  
10 different cost categories and a great many of them  
11 varied from year to year. As I recall, they were higher  
12 in the earlier years and tended to level off. I don't  
13 have the precise details with me. It was not across  
14 the board, no sir.

15 THE COMMISSIONER: Right.

16 MR. GIBBS: Q The difference,  
17 Mr. Dau, between the column,

18 "Total unescalated and total escalated"  
19 is made up of a combination of increased expenditures  
20 and inflation.

21 A Yes.

22 Q And would I be safe then  
23 to, for purposes of this exercise, to take total  
24 escalated as being up to a point in time about the end  
25 of 1983?

26 A With the -- yes, in a  
27 general sense, subject to checking. I do believe there  
28 are some compression costs after 1983, but this is  
29 generally correct. If you compare the two systems,  
30 that is so.



P.H. Dau  
Cross-Exam by Gibbs

1 Q And with respect to the  
2 prime route, those total escalated costs contemplate  
3 a fully loaded system with 2 1/4 billion cubic feet  
4 per day from Prudhoe and 2 1/4 billion from the delta.

5 A Yes.

6 Q And that figure then for  
7 the --

8 A That's the mainline is  
9 fully loaded; the laterals obviously aren't, sir.

10 Q Yes, and that figure for  
11 about the end of 1983 for the fully loaded mainline  
12 on the prime route, total escalated, is 7,937,880,000  
13 dollars.

14 A Yes sir.

15 Q And by a process of  
16 arithmetic from the same capital cost table, on Exhibit  
17 287 we determine that of that the Canadian portion is  
18 \$7,167,394,000.

19 A Yes sir.

20 Q And Mr. Marshall, does  
21 the witness yet have this book, the re-sized delivery  
22 line? That figure of \$7,167,394,000 appears also  
23 in the volume entitled:

24 "Amendment re size delivery lines."

25 I direct you to tab 10, page 1.

26 A Yes sir.

27 Q You agree with that?

28 A Yes, sir. I might add,  
29 Mr. Gibbs, they appear to be correct. There are no  
30 expenditures after 1983, I was in error.



P.H. Dau  
Cross-Exam by Gibbs

1 Q Now, at this point in  
2 time, Mr. Dau, are you able to give a segment breakdown  
3 of the capital costs incorporating the cross-delta  
4 route as the prime route selection.

5 A No, I have not done  
6 that, sir.

7 Q Mr. Dau, you understand  
8 -- I'm sure you do, I don't intend to be impertinent --  
9 you understand the meaning of the expression "cost of  
10 service"?

11 A Yes sir.

12 Q And could you define it,  
13 please? Would you define it, please?

14 A In a very simple-minded  
15 way, I view cost of service as the cost relating to  
16 the debt of the company plus a return to its shareholders  
17 plus the operating and maintenance expenses of the  
18 system.

19 Q And another way of  
20 referring to it is that is what the user of the line  
21 pays to the owner for carrying his gas.

22 A That's right.

23 Q And you mentioned the  
24 elements of it.

25 A There's probably taxes  
26 in there too, I would suspect.

27 Q And by large, by far the  
28 greater part of the components of cost of service in  
29 terms of dollars are related to the capital cost of the  
30 system.

A Yes.



P. H. Dau  
Cross-Exam by Gibbs

Q It is not unknown and in fact, it's quite frequent to express cost of service when you're making estimates as a percentage of capital cost.

A Yes, sir.

Q Now, Mr. Dau, would you turn to Schedule 4, under Tab 11 of the volume entitled "Amendment Resized and Delivery Lines".

THE COMMISSIONER: Do you have another copy of that by any chance, Mr. --

A Page 11, sir and ?

Q Tab 11, schedule 4.

A Set 4?

Q And we're going to be talking about 1984, Mr. Dau, because the -- I believe the total on escalated cost figure in Exhibit 287 is in fact about up to the end of 1983 so we'll look at 1984.

A Let's make sure I have got the same one, sir. It's under Tab 11 and it's the first blue divider that says Set 1, Base Case, Escalator Cost. In the upper right-hand corner, it says Section 2, Schedule 4, Base Case Escalator.

Q Yes.

A Thank you, sir.

Q And under the column, 1984, for total cost of service, you see the figure, \$1,514, 500,000.

A Yes, sir.



P.H. Dau  
Cross-Exam by Gibbs

1 Q And that is the total  
2 cost of service ~~which~~ the owner of the pipeline will  
3 be charging to the customers for 1984 through put.

4 A Presumably so. I'm  
5 not responsible for this section, sir.

6 Q No, but that's what it's  
7 conveys to both of us.

8 A Yes.

9 Q And in order to express  
10 that as a percent of capital cost which we agreed could  
11 be done, we would take the percentage which that repre-  
12 sents of the \$7,167,394,000 Canadian cost.

13 A Yes, sir.

14 Q Yes, and when you do  
15 that you find, sir, I think you find that in 1984 the  
16 cost of service is about 21.1% of the capital cost.

17 A I'll accept your  
18 arithmetic, sir.

19 Q And you could do that  
20 pretty quickly?

21 A That's right.

22 Q And that cost of service  
23 that we looked at for 1984 is expressed in terms, not  
24 of thousands of cubic feet but of millions of British  
25 thermal units?

26 I'm sorry the total dollars  
27 are in Mcf but the breakdown below it is in millions  
28 of British thermal units.

29 A Yes, sir, that's what  
30 it says.



P.H. Dau  
Cross-Exam by Gibbs

1 Q Yes. Now, would you keep  
2 that figure, that page open, Mr. Dau and thinking now of  
3 millions of British thermal units.

4 THE COMMISSIONER: Excuse me,  
5 Mr. Gibbs. I don't have this -- at least, I don't  
6 think I have.

7 MR. MARSHALL: I don't either.

8 THE COMMISSIONER: Well, you  
9 obviously regard this as important. Would it be  
10 appropriate to adjourn now and maybe the relevant  
11 pages could be photostated for all of the rest of us  
12 and we could follow this. Would that be -- ?

13 MR. GIBBS: Yes, sir, that  
14 would be --

15 THE COMMISSIONER: Well, let's  
16 adjourn now and come back at quarter to two and you  
17 could point out to Miss Hutchinson the pages we should  
18 examine and she could photostat them for us.

19 MR. GIBBS: All right, sir.

20 THE COMMISSIONER: Well, we  
21 will adjourn till quarter to two.

22 (PROCEEDINGS ADJOURNED TO 1:45)  
23  
24  
25  
26  
27  
28  
29  
30



R.A. Hemstock  
Exam by Commissioner

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)  
R.A. HEMSTOCK, recalled:

THE COMMISSIONER: I don't know whether you were here last week but Mr. Williams was questioned about this whole dispute about whether you can work in December and January in the Inuvik vicinity, whether you could actually have regular shifts ten hours a day, seven days a week on those two spreads near Inuvik, and he said it was his understanding that the Canol workers, the Canol construction project was carried out in the summer, and he said you had written a paper about the Canol project. Can you tell me if the Canol construction project -- I'm talking about the construction -- went on in December and January in the middle of winter? Do you happen to know that?

A My recollection is that it did not go on, that is the actual construction of the pipeline. There were other activities, of course, which did. I could check up on that, though, and confirm it.

Q Yes, if you could send your paper along if it isn't already an exhibit -- maybe it is, but if it isn't if you could give it to Mr. Marshall sometime and he can bring it up with him. It would be interesting to take a look at that.

A I certainly will make it available. It's a report which was done during the operation of the pipeline, which described how the pipeline was kept operating and the road which parallelled the pipeline.

Q After construction?



R.A. Hemstock  
P.H. Dau  
Cross-Exam by Gibbs

1 A Yes, after construction,  
2 and as I recall there is some comment in there about  
3 route selection and that sort of thing as in those  
4 days. We can make that available.

5 THE COMMISSIONER: Well, thank  
6 you. Well, carry on, Mr. Gibbs.

7 (WITNESS HEMSTOCK ASIDE)

7 MR. GIBBS: Mr. Dau, you can  
8 now confirm, can you, that as a result of our joint  
9 arithmetic the mileage, the right-of-way mileage, if  
10 one can use that term, of the portion carrying Alaskan  
11 gas through the prime route is shorter by the cross-  
12 delta route by 14.6 miles than it would have been  
13 through the previous prime route.

14 A Yes sir.

15 Q Yes, and then we took the  
16 next step to say that in pipeline miles we would  
17 have to add 36.5 because of the two lines across Shallow  
18 Bay.

19 A Yes sir.

20 MR. GIBBS: Mr. Commissioner,  
21 I think all interested parties have now been provided  
22 with copies of the pages from the volume entitled:  
23 "Amendment re size delivery lines,"  
24 in the order in which they appear, to which I will refer,  
25 and in the order in which they appear in that volume,  
26 but they are not consecutive pages. We were at, sir,  
27 Section 11, schedule 4 in that volume, which is the  
28 table attached to those xeroxed pages, the last of the  
29 xeroxed pages, and on that page, Mr. Dau, lines 7 to 11  
30 inclusive, set out the cents per million B.T.U.s cost



P.H. Dau  
Cross-Exam by Gibbs

1 of service by years to various delivery points.

2 A Yes sir.

3 Q And under 1984, which we  
4 were referring to, that's from the Alaska-Yukon border  
5 to Monchy, 97.3¢ per million B.T.U.s.

6 A Yes sir.

7 Q And Alaskan-Yukon border  
8 to Kingsgate, 94.4¢ per million B.T.U.

9 A Yes sir.

10 Q And Alaskan-Yukon border  
11 to Alberta-B.C. border, 89¢ per million B.T.U.

12 A Yes sir.

13 Q And I calculated -- I'm  
14 wrong, I'm not capable of calculating -- I had it  
15 calculated for me the weighted average at those delivery  
16 points, and we arrived at a figure of 96¢ rounded off  
17 per million B.T.U., and I derived that, sir, by taking  
18 on page 1, and going to page 1 under tab 8-B,

19 "Design and capacity of facility", and that's  
20 the first page of the xeroxed one, sir, to take the  
21 deliveries to those various points according to this  
22 last filing of re sized delivery lines, and then applied  
23 that to the cents per million B.T.U. to get a weighted  
24 average cents per million B.T.U. which came out at  
25 95.8¢. Will you agree or disagree?

26 A I'll accept your arithmetic  
27 sir. I don't have --

28 Q You'll accept my advisors'  
29 arithmetic which I have to do.

30 A All right.



P.H. Dau  
Cross-Exam by Gibbs

As I understand what he'S doing, I think it's correct,  
sir, yes.

Q So We have a weighted  
average at those delivery points of 95.8¢ for the  
portion within Canada.



P. H. Dau.  
Cross-Exam by Gibbs.

1  
2 A That would be correct sir  
3 because it is from Alaska-Yukon border.

4 Q And then to get the full  
5 cost of service per million BTU, we have to then to  
6 bring in the Alaska section because we are talking of  
7 Alaska gas.

8 A Yes, sir.

9 Q And according to Exhibit  
10 287, the letter from Mr. Marshall, the last sheet of  
11 Exhibit 287, the escalated capital costs for Alaska,  
12 that's segment number 1, are \$770,486,000.00?

13 A Yes, sir.

14 Q And then to get the cost  
15 of service for that portion, we could I take it, apply  
16 the 21% we previously developed as a percentage of  
17 capital costs and applying 21% times \$770,486,000.00,  
18 you derive an annual cost of service for 1984 for the  
19 Alaska portion of \$162,573,000.00. Do you accept that?

20 A I accept your arithmetic  
21 doing it that way sir. I am not responsible for  
22 any of the tariff calculations and presumably in some  
23 of the Alaskan filings there is a tariff put on, I don't  
24 know what it is.

25 MR. MARSHALL: Sir, we can  
26 accept Mr. Gibbs' hypothetical situation but as es-  
27 tablishing what sir? This is one way of perhaps getting  
28 some sort of a ball park estimate of the cost of service  
29 for a segment of a line but maybe it is right and maybe  
30 it is not right. He said this is one way that you can



P. H. Dau.  
Cross-Exam by Gibbs.

1  
2 kind of estimate it and--

3 MR. GIBBS: Well, sir we have  
4 been unable to find this figure so we have to develop  
5 it the best way we can and Mr. Dau had agreed that  
6 a method of making these estimates is to use cost of  
7 service as a percentage of capital costs and that on  
8 the Canadian portion that worked out to 21% and it  
9 seemed logical to us and I am sure is to Mr. Dau to  
10 apply that 21% to the Alaska portion to see, and I am  
11 the first to admit it is not a refined specific, down  
12 to the last dollar number, but it is a means by which  
13 we can get at the percent cost of service. Is it not  
14 Mr. Dau?

15 WITNESS DAU: I can accept  
16 it as a means of--

17 Q And so by doing that we  
18 get the annual cost of service in 1984 in Alaska at  
19 \$162,573,000.00, being 21% of the 770,000,000?

20 A Yes. I accept your arith-  
21 metic.

22 Q All right. Now, are you  
23 able Mr. Dau to confirm that the volume to be transported  
24 through the Alaska section, on the prime route in 1984,  
25 is 775 billion cubic feet? I will tell you how I got  
26 that.

27 A The number would be in the  
28 filings.

29 Q All right. It is 2.12  
30 billion cubic feet per day which is in your filing and



P. H. Dau.  
Cross-Exam by Gibbs.

1 that is derived by taking  $2\frac{1}{4}$  billion cubic feet per  
2 day less the compressor fuel?

3  
4 A All right sir I accept that.  
5 It is in the filing somewhere.

6 Q Which comes down to 2.12  
7 billion cubic feet per day which is 775 billion cubic  
8 feet in that year by simple multiplication.

9 A Fine sir.

10 Q Then Mr. Dau, isn't this the  
11 next logical step and that is to divide that 775  
12 billion cubic feet which will go ' / the Alaska section  
13 of the prime route in 1984, into the cost of service  
14 for that year in the Alaska section, which we determine to  
15 be \$162,573,000.00 to get the number of cents per Mcf  
16 for 1984?

17 A That would be the way you  
18 would get it sir.

19 Q And if you go through that  
20 division of 775 billion cubic feet into a \$162,573,000.00,  
21 I am told that the result is \$.21 per Mcf?

22 A Again, I accept your  
23 arithmetic sir.

24 Q And we then have derived  
25 the cents per Mcf cost of service for the Alaska section  
26 of the prime route in 1984?

27 A Yes.

28 MR. MARSHALL: Subject, of  
29 course, to your comment that this is one possible way  
30 of doing it. It is a rough ballpark figure. Mr. Dau



P. H. Dau.  
Cross-Exam by Gibbs.

1  
2 didn't derive these figures for the application.

3 THE COMMISSIONER: Well, no  
4 let Mr. Gibbs proceed with his proposition. We all  
5 understand that if his arithmetic is out of wack, then  
6 the whole thing may fall to the ground, but it is the  
7 method of calculation at the moment we are interested  
8 in.

9 MR. GIBBS: And then Mr. Dau  
10 one of the major items in which a consumer of gas is  
11 interested in, is its heating value.

12 WITNESS DAU: Yes, sir.

13 Q And so to get to a heating  
14 value transportation cost, we should convert the cubic  
15 feet to millions of British thermal units?

16 A Yes, sir.

17 Q And I determine from the gas  
18 composition section of your application that the Alaska  
19 gas has a BTU content of 1,145 and I am sure you are  
20 aware of that having worked on those numbers?

21 A That's in the application.  
22 I agree sir. It seems a reasonable number, I don't know  
23 the precise number.

24 Q And so then to convert to  
25 the thousand BTU standard measurement, we should  
26 multiply one thousand over 145 time \$.21 to get to the  
27 cents per million BTU transportation costs?

28 A Yes, sir.  
29  
30



P.H. Dau  
Cross-Exam by Gibbs

1  
2  
3 Q And when we do that,  
4 we come to 18.3¢ per million btu's for the Alaska  
5 portion of the prime route in 1984.

6 A Yes, sir.

7 Q Then to get the total  
8 cost for that Alaska gas, we should add that 18.3¢  
9 to the weighted average 96¢ that I developed with you  
10 a few minutes ago because that covered only the  
11 Canadian portion.

12 A Yes, sir.

13 Q And if we add those two  
14 together, we have a cost per million btu's for Alaska  
15 gas through the prime route at the 49th parallel of  
16 \$1.14.

17 A Yes, sir.

18 Q That's 96 plus 18.3

19 A Yes, sir.

20 THE COMMISSIONER: That's to  
21 get gas from Prudhoe Bay to the 49th parallel.

22 MR. GIBBS: Through the prime  
23 route in the volumes that they have calculated. \$1.14  
24 per million btu's.

25 Q Now, Mr. Dau, I now  
26 want to go through a similar exercise for the Fairbanks  
27 Corridor and if you turn to the capital cost estimates  
28 in Exhibit 287 for the Fairbanks Corridor, you find at  
29 the most -- at the farthest right-hand column, at the  
30 bottom the total project cost, escalated total, which we  
agreed was at the end of 1983 of \$10,927,271,000.



P.H. Dau  
Cross-Exam by Gibbs

A Yes, sir.

Q And if we take off the Delta lateral, which we should do if we're talking only of Alaska gas, we subtract from that--

THE COMMISSIONER: And if we're talking about a Foothills line too. Don't let me interrupt you. Carry on.

MR. GIBBS: I thought I was going to keep that and spring it as a surprise.

If we take away the Delta lateral, which on the table is shown under line segment Yukon, subtotal Delta lateral in that column, we would subtract \$2,532,866,000.

A Yes, sir.

Q And the result of that subtraction would be for the portion of the Fairbanks route carrying only Alaska gas, \$8,394,405,000.

A Yes, sir.

Q And, that in the year, the beginning of the year 1984, when you have a capacity of transporting 4 1/2 billion cubic feet through that 48 inch line.

A No, sir. You have a capacity of 4 1/2 billion cubic feet from Whitehorse junction to Caroline. A capacity of 2 1/4 from Prudhoe to Whitehorse junction and then some lesser quantities in the two southern delivery legs.

Q That's because you have to add some compression?



P.H. Dau  
Cross-Exam by Gibbs

1 A Yes, sir.

2 Q Yes, well I'll come  
3 then to the compression.

4 But insofar as your line  
5 size, 48 inch line size, you have that 4 1/2 billion  
6 cubic feet per day capacity from Prudhoe Bay down to  
7 Caroline recognizing you need some more compression.

8 A Yes, sir.

9 Q And the additional  
10 compressor stations you require would be 17 in number,  
11 Mr. Dau?

12 You told us that in the  
13 volume entitled "Alternate Routes" or "Alternate  
14 Corridors" that an additional 17 would be needed if  
15 the Fairbanks Corridor was used.

16 A I believe that's correct.  
17 I think I could double check. 17 -- Yes, sir, that's  
18 correct. From Prudhoe Bay to the Whitehorse junction.

19 Q Yes. And if those  
20 additional 17 stations were put into service, then you  
21 would have that capacity of 4 1/2 billion cubic feet  
22 per day down from Prudhoe Bay to Caroline.

23 A Yes, sir.

24 Q Mr. Dau, we attempted to  
25 compute the cost of those additional compressor stations  
26 and I can go through the method with you if you wish.  
27 We came out with a cost of \$46.26 million each for those  
28 additional 17 compressor stations.

29 A 6.

30



P.H. Dau  
Cross-Exam by Gibbs

Q 26 millions, each.

A My number on the total  
would be slightly larger. I anticipated your question  
and I have a number of 905 million. Those are our  
escalated costs, sir.

Q Well, we used escalated  
costs also, sir, and I suppose we could argue about  
the escalation and as my numbers go on my figures  
perhaps we can follow right through on that basis.

A Yes, sir.



P.H. Dau  
Cross-Exam by Gibbs

1 Q At my number of 46.2  
2 million dollars each, multiplied by 17, we would have  
3 to increase the capital cost on the Fairbanks route by  
4 \$786 million.

5 A Yes sir.

6 Q And your figure is  
7 roughly 900. Using my figure, then, we would have  
8 to add that 787 million to the 8,394,000,000 which  
9 I previously derived by subtracting the delta section  
10 from the total escalated costs.

11 A Yes sir.

12 Q And when I add that I  
13 get for the cost of carrying 4 1/2 billion cubic feet  
14 per day from Prudhoe Bay to Kingsgate and Monchy via  
15 the Fairbanks corridor an escalated capital cost of  
16 \$9,180,825,000.

17 A Yes sir.

18 Q And then, sir, I tried  
19 to derive the annual cost of service for that capital  
20 cost from Prudhoe Bay, and used the same 21% figure  
21 that we had earlier derived. Do you follow me?

22 A Yes, I understand.

23 Q And if you apply 21%  
24 against that capital cost we -- the resultant figure  
25 for the cost of service in 1984 is \$1,937,000,000.

26 A Fine, sir.

27 Q And that's just a simple  
28 mathematical calculation, and are you able, Mr. Dau,  
29 to state what volume will be delivered at Kingsgate,  
30 Alberta Natural, and Monchy if you deliver 4 1/2 billion



P.H. Dau  
Cross-Exam by Gibbs

1 cubic feet per day into the line at Prudhoe Bay?

2 THE COMMISSIONER: You mean  
3 deducting for fuel consumed?

4 MR. GIBBS: Yes, because we  
5 don't have that fuel consumption.

6 MR. MARSHALL: 4.5 billion  
7 cubic feet in Prudhoe Bay?

8 MR. GIBBS: Yes.

9 MR. MARSHALL: Well sir, that's  
10 got nothing to do with my client's application.

11 MR. GIBBS: Well, Mr. Marshall,  
12 we've got the matter, we've got a 48-inch pipeline,  
13 we've added the compression, and we know that it's  
14 sized to carry 4 1/2 billion, so by 1984 we have the  
15 line full, which is 4 1/2 billion cubic feet a day  
16 and now I want to derive from Mr. Dau, if I can, how  
17 much of the 4 1/2 million cubic feet per day should  
18 be deducted for fuel costs.

19 THE COMMISSIONER: We've come  
20 this far, Mr. Marshall.

21 MR. MARSHALL: Sure.

22 THE COMMISSIONER: Along this  
23 line of questioning, and the purpose, I take it, is  
24 to compare the cost to the American consumer of Alaskan  
25 gas via the Fairbanks route and via the prime route  
26 Arctic Gas proposes to take and<sup>to</sup> make a fair comparison  
27 Mr. Gibbs says you have to assume that the line up  
28 the Mackenzie Valley would be fully loaded with  
29 American gas. That's where we seem to be at this point.  
30 Is that where we are?



P.H. Dau  
Cross-Exam by Gibbs

1 MR. MARSHALL: No, we're not  
2 there, sir.

3 THE COMMISSIONER: All right.

4 MR. MARSHALL: If that's where  
5 we're trying to go, sir, is that really of interest  
6 to the Inquiry?

7 THE COMMISSIONER: Well, that  
8 question has been running through my mind, but this is  
9 a matter that I agreed in Whitehorse could be enquired  
10 into. Mr. Dau is here and having set our hand to the  
11 plow, I think we should carry on with this and let  
12 Mr. Dau get back on the plane and we'll return to grass  
13 seed.

14 MR. MARSHALL: You want the  
15 farmer to carry on, do you?

16 THE COMMISSIONER: Well, carry  
17 on, Mr. Gibbs.

18 MR. GIBBS: I'll continue  
19 plowing, but I'm not going to go much farther down  
20 with the furrow, sir.

21 THE COMMISSIONER: Well, carry  
22 on.

23 A I'm sorry, Mr. Gibbs,  
24 I've lost the question. What was the question?

25 MR. GIBBS: Well, what I was  
26 really trying to get at, sir, was the amount in percen-  
27 tage terms of fuel loss between Prudhoe Bay and the  
28 delivery points, through the Fairbanks corridor carrying  
29 4 1/2 billion cubic feet per day. Now we discovered in  
30 the prime route that your fuel usage was 5.2%.



P.H. Dau  
Cross-Exam by Gibbs

1 A For the total system,  
2 sir?

3 Q Yes.

4 A The number would be a  
5 slightly higher percentage, I suspect, because as I  
6 understand the system you are developing is fully  
7 loaded.

8 Q Yes.

9 A Throughout its full  
10 length, therefore the number would be slightly higher.

11 Q Yes. We expected it would  
12 be higher and so for our calculations we moved it up  
13 to 7%, which would be a fairly generous addition.

14 A That seems reasonable,  
15 sir.

16 Q Yes, and so if you de-  
17 crease the 4 1/2 billion cubic feet per day, Mr. Dau,  
18 by 7% for fuel loss, we come down to 4.19 billion  
19 cubic feet per day.

20 A Fine, sir.

21 Q And that by another process  
22 if multiplication gets to 1,529 billion cubic feet per  
23 year.

24 A Fine, sir.

25 Q And then we go through a  
26 similar division to get the cost of service for 1984,  
27 as we did before, this time we divide 1,529 billion  
28 cubic feet through that system from Prudhoe Bay to the  
29 delivery points --

30 A Excuse me, Mr. Gibbs,



P.H. Dau  
Cross-Exam by Gibbs

1 this American gas, the Alaskan gas is going to Caroline  
2 and then it's going to go to the 49th Parallel  
3 presumably on some split basis.

4 Q On the split basis that  
5 you've told us about, sir,

6 A The same percentage  
7 splits, the full 4 1/2 billion.

8 Q Yes.

9 A I think that would require  
10 some additional compression on those delivery legs.

11 Q Perhaps one compressor,  
12 as I understand it.

13 A I don't know, I've not  
14 done the calculations, sir.

15 Q Well then, perhaps we can  
16 at this point say that my calculations might be out by  
17 the cost of one or two compressor stations.

18 A Whatever.

19 Q Which would be a fairly  
20 small percentage of the total cost.

21 A It's not a very large  
22 percentage of total cost, sir.

23 Q So if we go through that  
24 step of dividing 1,529, billion cubic feet  
25 through the line from Prudhoe Bay to the delivery points  
26 in 1984 into the cost of service we <sup>developed</sup> as a percent-  
27 tage of total cost, which was 1,937,000,000 dollars,  
28 we come to \$1.27 per Mcf.

29 A I accept your arithmetic,  
30 sir.



P.H. Dau  
Cross-Exam by Gibbs

1 Q But the previous figure  
2 we developed for the prime route of \$1.11 was in  
3 terms of millions of B.T.U.s, so that we should convert  
4 these Prudhoe Bay Mcfs. to millions of B.T.U.s to make  
5 a comparable figure.

6 A Yes.

7 Q And the Prudhoe Bay  
8 gas, as we previously agreed, is 1145 B.T.U. and so  
9 to convert we would take 1,000 over 1145 and multiply  
10 it by \$1.27.

11 A Right, sir.

12 Q And that would come out  
13 at \$1.11.

14 A Right.

15 THE COMMISSIONER: Now that's  
16 for the Fairbanks route?

17 MR. GIBBS: Yes.

18 THE COMMISSIONER: And so you  
19 say that to take American gas from Prudhoe Bay to the  
20 49th Parallel along the prime route up the Mackenzie  
21 Valley would cost \$1.14 per million B.T.U.s to the  
22 American consumer; the comparable figure on the Fairbanks  
23 corridor is \$1.11 per million B.T.U.s. Now that's --  
24 I'm with you to this point, though I may not have stayed  
25 on board throughout the last half-hour of calculations.

26 MR. GIBBS: Well, that's the  
27 point I sought to reach with Mr. Dau for this reason,  
28 sir. At Whitehorse Mr. Hemstock stated that one of the  
29 reasons why the Fairbanks corridor had been rejected  
30 was because of the unit cost of transportation, and I



P.H. Dau  
Cross-Exam by Gibbs

1 believe and I submit that through this exercise we've  
2 demonstrated that there really is no substantial differ-  
3 ence to the American customer per million B.T.U.s which  
4 is what he is interested in.  
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P. H. Dau.  
Cross-Exam by Gibbs.

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A Mr. Gibbs, respectfully sir, you are comparing apples and oranges. You have gone through an exercise of a fully loaded 48 inch pipeline, transporting 4½ billion cubic feet of gas from Prudhoe down the Fairbanks corridor to the 49th parallel?

Q Yes.

A And you are comparing it to the prime route or the cross-delta route, or which ever one you want to pick, which has the Prudhoe Bay lateral at half capacity, if you like, at a premium, cost premium of transportation and--

THE COMMISSIONER: Excuse me.  
Repeat that last sentence if you don't mind.

A On either the prime route or the cross-delta route that Mr. Gibbs is comparing this Fairbanks case to. The Prudhoe lateral that goes with from Prudhoe Bay over to the junction / the delta lateral is carrying two and a quarter billion cubic feet a day under the circumstances.

THE COMMISSIONER: Not 4½?

A Not 4½.

THE COMMISSIONER: Well, we I think have all been conscious of that/throughout the--

MR. GIBBS: But, Mr. Dau, if you are the American consumer sitting on the south side of the 49th parallel, what your looking at is the cost per million BTU's and you have chosen to operate part of your system at half capacity but he is going to pay his \$1.14 on the prime route because of that decision



P. H. Dau.  
Cross-Exam by Gibbs.

1  
2 and if you operated at full capacity then aren't you in  
3 to looping the mainline from the delta down to Caroline  
4 and increasing the capital costs?

5 MR. MARSHALL: Well, sir I think  
6 this is really quite unfair. I think Mr. Dau's point  
7 is well taken. Mr. Gibbs, with all due respect, is  
8 trying to compare two things that simply can't be  
9 compared. It is just not that simple. Now the end  
10 figures happen to come out as numbers that Mr. Gibbs  
11 is happy about but it is just not a fair comparison.  
12 Where does it take us? And what the American consumer  
13 wants,--

14 THE COMMISSIONER: He may or  
15 may not get.

16 MR. GIBBS: Mr. Hemstock was  
17 concerned about the American consumer in saying that  
18 the price was too high. Now, Mr. Commissioner if Mr.  
19 Dau is going to start filling his Alaska leg in the  
20 prime route then he has got to add <sup>to</sup> the mainline because  
21 he hasn't got enough capacity for Travillant Lake south.

22 So, then we increase the capital  
23 costs and we are into a different set of calculations  
24 altogether.

25 MR. MARSHALL: Surely that is  
26 not the case at all. I don't want to get into an  
27 argument.

28 THE COMMISSIONER: Excuse me  
29 Mr. Gibbs. Mr. Marshall, if you want to make an  
30 objection, go ahead, and I will hear you out.



C. F. Dau.  
Cross-Exam by Gibbs.

1  
2 MR. MARSHALL: Well I do object.  
3 It is not a matter of looping, it is a matter of putting  
4 4½ billion cubic feet of gas out of Prudhoe Bay eastward  
5 along that slope, if the gas were available which, of  
6 course Mr. Gibbs hasn't--

7 THE COMMISSIONER: But those  
8 are points that you can make that go to the validity  
9 of this whole argument but I feel obliged to let Mr.  
10 Gibbs pursue the matter and set up his proposition. You're  
11 still in a position to shoot him down after that but I  
12 think we should let the discussion Mr. Gibbs is having  
13 with Mr. Dau proceed to its conclusion whether that be  
14 a logical conclusion or an illogical one. We'll see.

15 MR. GIBBS: Well, Mr. Dau on  
16 the basis of the calculations we have gone through, you  
17 do agree with me, I take it, that the cost per million  
18 BTU at the 49th parallel will be approximately the same  
19 for Alaska gas whether it comes through a fully loaded  
20 <sup>corridor</sup> Fairbanks/route or through the prime route, with the  
21 main part of the prime route being fully loaded?

22 MR. DAU: No, sir. I cannot  
23 agree with that because your starting out with one  
24 assumption that your taking 4½ billion cubic feet of  
25 gas from Prudhoe Bay for one case and only 2½ for the  
26 other case. And I don't think that you can compare  
27 the two on that basis. In my view, if you want to  
28 compare two routes, you must look at the two routes on  
29 the basis of the same throughputs.

30 In other words, if you wish to



P. H. Dau.  
Cross-Exam by Gibbs.

1  
2 compare a pipeline route from Prudhoe Bay to Caroline  
3 on the Fairbanks corridor with the pipeline route from  
4 Prudhoe Bay to Caroline on the prime route with the  
5 same delivery systems south of Caroline, it is my view  
6 sir that the unit, or the total transportation cost will  
7 be less on the prime route, only considering Alaskan  
8 <sup>and</sup> gas/at the level that you have picked at 4½ billion  
9 feet a day.

10 The reason I say that is that  
11 that system, comparing two systems which do exactly the  
12 same thing, is 300, I believe, 326 miles shorter on  
13 the prime route and is some billion dollars less  
14 expensive. But in that case we are comparing systems  
15 that do the same things.

16 Q Yes sir Mr. Dau, but let me  
17 not be an American consumer, but let me suggest that  
18 the American consumer sitting south of the 49th parallel  
19 is looking at your project and he is going to work it  
20 out in costs per millions of BTU's the way that you have  
21 designed it; he is going to look at your prime route  
22 and say that at the 49th parallel delivery points, it  
23 is going to cost me about \$1.14 per million BTU's, the  
24 way it is now designed.

25 A Yes, sir.

26 Q Yes, sir. And then isn't  
27 he going to look at your Fairbanks alternative and say  
28 now if that alternative was used, it could carry 4½  
29 billion cubic feet a day and we wouldn't have that half  
30 empty capacity across the North Slope and the gas then



P. r. Dab.

Cross-Exam by Gibbs.

1  
2 would cost me \$1.11 per million BTU's. Isn't that the  
3 practical way for that consumer to look at it?

4 A Not in my view sir because  
5 you are back to the very-- The problem I have is that  
6 your starting out with two different volumes and if your  
7 going to compare them I think you have to have the same  
8 volumes to compare them.

9 Q Well, Mr. Commissioner I  
10 think I have, although Mr. Dau disagrees, I have got  
11 to the end of the furrow and demonstrated that the  
12 person sitting south of the border can compare these  
13 and say to themselves that in terms of million BTU's  
14 there is not really any difference bringing the gas  
15 through the Fairbanks corridor or through the prime  
16 route as it is presently constituted.

17 MR. MARSHALL: Well there is  
18 no evidence on that sir. That's maybe his argument and  
19 he may think that that is the conclusion that can be  
20 drawn. The witness certainly doesn't agree with that.

21 MR. GIBBS: Well--

22 THE COMMISSIONER: Well if your  
23 conclusion is sound then-- Yes, I see.

24 MR. GIBBS: I think sir that if  
25 the conclusion is sound, we are at this point, the  
26 applicant's own witnesses have <sup>with</sup> at sometime / qualification  
27 admitted that the Fairbanks route is more environmentally  
28 acceptable and other people have said so and it leaves  
29 the North Slope, of course, untouched and the unit cost  
30 is about the same. And that is the point I sought to



P. L. Dau.  
Cross-Exam by Gibbs.

1  
2 reach through going through this exercise.

3 MR. COMMISSIONER: Thank you.  
4 Mr. Dau, let me just ask you about some of these figures.  
5 If you look at the last attachment to Mr. Marshall's  
6 letter which is the cost of the Arctic Gas prime route.  
7 The sub-total in the bottom right hand corner, the  
8 sub-total capital cost for Canada, that is a system  
9 within Canada, in 1974 dollars is \$5,640,000,000.00.  
10 The escalated cost is \$7,167,000,000.00. Now that is  
11 your costs looking at 1983. The project costs in the  
12 U.S. and Canada are \$6,230,000,000.00 in 1974 dollars,  
13 \$7,937,000,000.00 in 1983 dollars subject to what you  
14 said about the calculations being based on when the  
15 expenditures are made.

16 Given your current planning,  
17 the main expenditures would be incurred., I take it,  
18 between-- --in the winter of 78 and 79, 79 and 80 or  
19 maybe 81 or am I a year too far ahead? Is it--?

20 WITNESS DAU: It will be three  
21 winters sir, which is correct.

22 THE COMMISSIONER: Yes. So  
23 that-- Now if that increase is to cope with inflation  
24 and increased prices, that means that from 1974 to  
25 1983 the increase, whether you take the system within  
26 Canada or the total system, the increase you have  
27 allowed for, to cover for inflation is something like  
28 20% over the best part of a decade which would be an  
29 allowance for inflation of something like 2% a year  
30 which doesn't sound quite right to me. Do you want to  
comment on that?



P.H. Dau  
Cross-Exam by Gibbs

1

2

A Yes, sir.

3

Q You are expecting the

4

recent program of the federal government to achieve

5

a measure of success that no one else is entirely

6

sure of.

7

A I was going to say we

8

are very efficient but --

9

Q But you anticipated it.

10

A Now, the calculations

11

for cost escalation, sir, is and I don't have the pre-

12

cise numbers but it, as I remember them from '74, the

13

escalation between '74 and '75 by components, depending

14

on what components they were had a higher level of

15

12% and some items were down in the 4% range depending

16

on certain items of material and equipment and so on.

17

Q That's from '74 to '75.

18

A '74 to '75. They tended

19

to decrease as time went on and I seem to remember that

20

in the latter part of the project, the average

21

escalation rate that was assumed or was developed for

22

us by these consultants to Arctic Gas was on the, I

23

believe the 4 1/2% per year range. But what happens

24

to this number and I believe the number is 26%

25

escalation in this time frame, is that you are spending

26

money as time goes on and you can't just divide by

27

the number of years and get an average rate, so that

28

it's a decreasing escalation rate over the life of the

29

project and as I say I'm searching my memory. I can't

30

remember the averages that they were -- 8% averages



P.H. Dau  
Cross-Exam by Gibbs

1 perhaps the first year, gradually declining to something  
2 on the order of 4 1/2% at the end of the project.

3 Q Right but if you take  
4 the 1974 figure and then if you take it that in the  
5 winter of '78- '79, '79-'80, '80-'81, that those are  
6 the peak winters of construction activity. That  
7 means that you should at least take this -- you could  
8 round it off at about 1980 because you wouldn't be  
9 spending the money till that three-year period and you  
10 have spent just about all of it at the end of the  
11 three-year period so you would be going from -- instead  
12 of going from 1974 to 1983, if we went from 1974 to  
13 1980, we would be fairer to you in these calculations.

14 A Yes, sir. And also  
15 recognizing that a lot of the materials, pipe, for  
16 instance, are bought a year to a year and a half ahead  
17 of time because of deliveries so really the way you  
18 spend the money is a lot of it is in the early project  
19 and it also tends to take it off.

20 Q All right. Well, take  
21 another year off to allow for that. That takes us  
22 from 1974 to 1979. That's five years. That's a nice  
23 round figure. Your calculations in 1974 are based on  
24 the estimated wages that you would have to pay construc-  
25 tion crews. You have to presumably escalate those  
26 and allow for an inflationary factor. The federal  
27 government has now made it clear that that factor can  
28 be no higher than 10%.

29 A Right, sir.  
30



P.H. Dau  
Cross-Exam by Gibbs

1 Q The construction  
2 equipment -- you have to purchase 700 tractor units,  
3 400 units of earth moving equipment, 100 bending  
4 machines and crushing plants, 350 tractor trucks, 350  
5 trailer units and 1500 other trucks that apparently are  
6 from one half ton to sixteen tons.

7 You will be purchasing  
8 that equipment if this schedule is adhered to, late in  
9 the current decade.

10 A No, sir. Those particular  
11 items are purchased very early in the project because  
12 they are all required for construction.

13 Q All right. That's true.

14 A Yes.

15 Q But you took the figures  
16 that you would represent the costs with respect to that  
17 equipment in 1974 and I'm suggesting that the  
18 escalated costs would really be costs representing what  
19 you would have to pay over a period that was mid-point,  
20 would be 1979. Just to round it off.

21 A Okay, fine, sir.

22 Q Now, you say that the  
23 allowance here -- I said 20%. You said it's 25%.

24 A I believe so, sir.

25 Q So that's 25% over five  
26 years which is 5% a year so that in terms of wage cost  
27 and equipment, your estimates are based on a 5%  
28 inflation rate each year over the next five years.

29 A I could provide that  
30 table to you, sir, that would illustrate how it is



P.H. Dau  
Cross-Exam by Gibbs

1 calculated and it's pretty dangerous to try to  
2 average things out. It just doesn't work that way.  
3 THE COMMISSIONER:  
4 Well, it might be pretty dangerous, at least unwise or  
5 imprudent to assume that inflation is going to be  
6 no more than 5% each year over the next five years in  
7 relation to wages and costs of equipment.

8 Well, that's fine. I  
9 entirely appreciate that this isn't an accurate way  
10 of doing it but we at least have taken the three year  
11 construction period which would peak at about 1980.  
12 We have taken a year off that back to 1979 to allow  
13 for the fact that you would be purchasing the equipment  
14 at the beginning of the construction period but really  
15 our wage cost would run right through to 1981'82.

16 A Yes, sir.

17 Q And, well, this is a  
18 concern that we'll come to in Phase Four because the  
19 total escalated costs north of the sixtieth parallel  
20 and the Northwest Territories and the Yukon are  
21 4,299,000,000. That is, it appears to me to be based  
22 on 5% inflation each year in 1979 from 1974 and if  
23 inflation -- if the rate of inflation over the last  
24 five years is any indication or even if the govern-  
25 ments attempt to confine it to a 10% level is any  
26 indication of what to expect over the next five years,  
27 then this might not be an accurate forecast.

28 Does  
29 anybody have -- do counsel have any other questions  
30 of Mr. Dau arising out of what Mr. Gibbs put to him or  
what I put him?



P.H. Dau  
Cross-Exam by Goudge

1  
2 CROSS-EXAMINATION BY MR. GOUDGE:

3 MR. GOUDGE: Q I just  
4 wondered, one question, Mr. Dau, whether you would have  
5 any estimation based on what you see to be a fair  
6 comparison namely of fully loaded lateral from Alaska  
7 that  
8 to the Delta coupling /to a looped mainline down the  
9 Mackenzie Valley and what that would do to your price  
per btu at the American border?

10 A I don't have it precisely  
11 that way, Mr. Goudge. I looked at it in a slightly  
12 different basis. I assumed that -- or I assume I  
13 completely ignored any Mackenzie Valley gas at all,  
14 Delta gas at all and just compared the two routes on  
15 the basis of 4 1/2 billion feet a day from Prudhoe  
16 going down to Caroline and then making the very  
17 simplified assumption that we didn't have to do  
18 anything south of Caroline to change the numbers  
19 because it was the same in both cases so it's not  
20 really precise, but on doing it that way, I find the  
21 difference between the Fairbanks and the prime route  
22 as 1.4 billion dollars with the Fairbanks Route, of  
23 course, being the most expensive. That would be, on  
24 that basis the Fairbanks Route is about \$9.3 billion  
25 and the prime route is about \$7.9 billion so that  
26 percentage would presumably apply to unit transportation  
27 costs. Whether they were on Mcf or million btu basis.

28 Q On the basis of the  
29 way your project is presently designed, that cost  
30 calculation would have to assume a looped mainline?



P.H. Dau  
Cross-Exam by Goudge

1

A That is correct, sir.

2

Yes, I just didn't go through the loop in calculation.

3

Q I just have one

4

other question. Out of curiosity, if you say that the  
cost of service is 21.4% of the capital cost, does  
that mean that the capital cost can conceptually be  
said to be fully recovered in five years?

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P.H. Dau  
Cross-Exam by Goudge  
Re-Direct

1 A No sir, because that 21%  
2 includes operations and maintenance expense and some  
3 tax component and return to shareholders and so on,  
4 however, if I understand your question.

5 Q I wondered, sir, when  
6 you said that the cost of service was the cost paid  
7 to the carrier --

8 A Yes.

9 Q -- for the carrying of  
10 gas, and if that is 21.4% of the capital cost of the  
11 line, as you said --

12 A Yes.

13 Q -- doesn't the carrier  
14 receive 100% of the capital cost of the line from  
15 his customers over five years?

16 A Yes, that's true.

17 MR. GOUDGE: I have no more  
18 questions.

19 MR. MARSHALL: Sir, I have a  
20 couple of questions arising out of what my learned  
21 friends have asked.

22

23 RE-DIRECT EXAMINATION BY MR. MARSHALL

24 Q Mr. Dau, you've indicated  
25 that you have given some consideration to the relative  
26 costs of a pipeline hypothetical situation of one  
27 carrying 4.5 billion cubic feet of gas from Prudhoe  
28 Bay to Caroline, and the first alternative was going  
29 the prime route, and the second alternative was going  
30 the Fairbanks route.



P.H. Dau  
Re-Direct

1 A Yes sir.

2 Q And that was the comparison  
3 that you drew and was that the one that your 1.4 billion  
4 dollar difference in capital costs related to?

5 A Yes sir.

6 Q And what's the difference  
7 in length of those lines, sir, approximately?

8 A Slightly in excess of 300  
9 miles, it's either 314 or 328.

10 Q Do you know, Mr. Dau,  
11 whether or not there's sufficient reserves at Prudhoe  
12 Bay that have been discovered that would support  
13 4.5 Bcft of gas up to now?

14 A I don't.

15 Q I take it, sir, that the  
16 alignment suggested by Mr. Gibbs, that of the Fairbanks  
17 route, would not make it possible for gas to be taken  
18 from the Mackenzie Delta without the construction of  
19 an entirely new pipeline.

20 A That's correct.

21 Q Have you any idea, sir,  
22 what the --

23 THE COMMISSIONER: Mr. Gibbs and  
24 you are at one on that, Mr. Marshall.

25 MR. MARSHALL: Yes sir.

26 Q But Mr. Dau, in the event  
27 that such a hypothetical line as we are discussing  
28 from Prudhoe Bay via the prime route down to Caroline  
29 were to be built to carry only American gas, would it be  
30 possible, in your opinion, for that line to be looped



P.H. Dau  
Re-Direct

1 to pick up any gas reserves in the delta?

2 A Yes sir.

3 Q Can you give us any  
4 indication of the relative cost of looping such a line  
5 from the delta to Caroline, relative to constructing  
6 an entirely separate line to carry the same volume of  
7 gas?

8 A It would depend on the  
9 quantity of gas. If it is a very significant percentage  
10 of the gas that's carried out of Prudhoe, it would be  
11 cheaper via the looping process.

12 MR. MARSHALL: Thank you.

13 I think those are all the questions I have, sir.

14 MR. GIBBS: Mr. Marshall raised  
15 a question that I hadn't raised in my direct, and that  
16 was the question of the sufficiency of the Prudhoe  
17 Bay reserves.

18 THE COMMISSIONER: Well, you're  
19 entitled to go into that. I was going to, before you  
20 do. I was just going to say, Mr. Dau, that you don't  
21 know whether there are sufficient reserves at Prudhoe  
22 Bay to justify a 48-inch line carrying 4 1/2 billion cubic  
23 feet a day from Prudhoe Bay to the 49th Parallel.  
24 But your line from Prudhoe Bay through the Mackenzie  
25 Delta has been sized at 48 inches and is capable of  
26 carrying precisely that amount.

27 A Yes sir. Those were on  
28 the instructions of the client, sir.

29 THE COMMISSIONER: Oh yes.

30



P.H. Dau  
Re-Cross-Exam by Gibbs

1 RE-CROSS-EXAMINATION BY MR. GIBBS:

2 Q And at Whitehorse, sir,  
3 you had a confident expectation that there would be  
4 sufficient reserves to fill that 48-inch line.

5 A Yes sir, at some time  
6 in the future.

7 THE COMMISSIONER: Well, any  
8 re-direct?

9 MR. MARSHALL: Not arising out  
10 of that, sir.

11 (WITNESS ASIDE)

12 MR. MARSHALL: Mr. Commissioner,  
13 the day is moving on. Is it intended that we sit this  
14 evening? And tomorrow do you intend to sit until one,  
15 do you, sir?

16 THE COMMISSIONER: Yes, I  
17 think so. Is that all right with you?

18 MR. MARSHALL: Well, that's  
19 fine, sir, P.W.A. makes these arrangements for us to  
20 leave at seven in the evening, so it really makes no  
21 difference to us. We're available, whatever is con-  
22 venient.

23 THE COMMISSIONER: Well, I --

24 MR. MARSHALL: Mr. Goudge, I  
25 think, has indicated that there are some at the Inquiry  
26 who want to catch the two o'clock plane, so that's  
27 suitable to us; but that leads me to enquire, sir,  
28 whether or not counsel have any plan for the continu-  
29 ation of this cross-examination? Mr. Goudge has  
30 suggested that perhaps some of the witnesses will not



1 be reached at all, and it may be that they can step  
2 down and return on the week of the 2nd.

3 THE COMMISSIONER : Well, I  
4 suggest that , that's a good point, I would suggest  
5 that Dr. McCart and Dr. Gunn might be asked to remain  
6 and the other witnesses left free to leave tonight or  
7 this afternoon.

8 MR. MARSHALL: The indication  
9 that I had, sir, was that Commission counsel and Mr.  
10 Bayly between them have enough questions to exhaust  
11 the remaining time --

12 MR. GOUDGE: And the rest of  
13 us.

14 MR. MARSHALL: -- with Dr.  
15 McCart, and Dr. Gunn wouldn't be reached.

16 THE COMMISSIONER: All right.

17 MR. GOUDGE: Perhaps if we  
18 could prevail on Mr. Hemstock, sir, to stay too.

19 MR. MARSHALL: Well, Mr.  
20 Hemstock was intending to stay, in any event, sir.

21 THE COMMISSIONER: Well --

22 MR. MARSHALL: The estimate  
23 that I had was that --

24 THE COMMISSIONER: Friday  
25 is doomsday , at least that's what I'm  
26 being told.

27 MR. MARSHALL: Well, I would  
28 suggest then that perhaps Dr. Gunn won't be reached  
29 at all from what Mr. Bayly and Mr. Goudge have told  
30 me, they have very extensive lists of questions for



1 Dr. McCart.

2 THE COMMISSIONER: Mr. Dau,  
3 thank you very much, sir, for coming up again and I  
4 understand that Mr. Hemstock and Dr. McCart will remain.  
5 Dr. Banfield and Mr. Jakimchuk are free to leave, and  
6 perhaps Dr. Gunn, we might see how we stand around  
7 four o'clock, 4:30.

8 MR. MARSHALL: Fine, sir.

9 THE COMMISSIONER: We'll break  
10 for coffee now.

11 (PROCEEDINGS ADJOURNED FOR FEW MINUTES)

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Banfield, Gunn, Hemstock,  
McCart  
Cross-Exam by Bell

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

THE COMMISSIONER: Well, I think we are ready for Mr. Bayly to begin his cross-examination. Before he does, Mr. Hemstock, I want you and your colleagues to know that when I said during Mr. Dau's evidence, we would get back to grass seed soon. I hope you didn't think that I was denigrating the importance of your evidence in any way because these environmental questions are absolutely fundamental. It's just that occasionally we call witnesses like Mr. Dau and it makes us all feel like billionaires and Well carry on, Mr. Bell.

ALEXANDER WILLIAM FRANCIS BANFIELD  
WILLIAM W.H. GUNN  
RUSSELL ALEXANDER HEMSTOCK  
PETER J. MCCART: Resumed

CROSS-EXAMINATION BY MR. BELL:

Q Dr. McCart, I would like to put a hypothetical question to you and I want you to assume the following situation if you would.

Sometime after the pipeline has been built across the Peel River, supposing that the old prime route or the interior route were used. A group of residents of Fort McPherson who know how to use the domestic fishery in the vicinity of the crossing, find one summer that their catch is substantially lower than the previous summer. Now, they suspect that the lower catch may be due somehow to pipeline activity and they want to make a claim for compensation and you, sir, are chosen to adjudicate



Banfield, Gunn, Hemstock,  
McCart  
Cross-Exam by Bell

1  
2 on the facts of the case. The question I would like  
3 to ask you is this. What evidence would you as a  
4 scientist require before you could make a judgment  
5 whether the reduced catch was due to pipeline activity  
6 or not?

7 WITNESS MCCART: Well, I  
8 think first of all, I would have to know what the  
9 initial size of the population was so that I could  
10 satisfy myself that in fact there had been a reduction  
11 in the size of the catch or excuse me, the size of the  
12 population.

13 Q The fish population.

14 A Yes, it's very easy to  
15 demonstrate that there is a reduction in the size of  
16 the catch but it is much more difficult to establish  
17 that in fact that this is due to a reduction in the  
18 size of the population and not due to some short-term  
19 change in the timing of migration or a particular  
20 path that the fish took in moving up the Peel River is  
21 conceivable and in one year they might take an unusual  
22 path up the center channel or one bank as opposed to  
23 the other bank where they may have more traditionally  
24 gone.

25 I would also require  
26 evidence that there was demonstrated mortality it  
27 seems to me as a result of some aspect of the functioning  
28 of the pipeline.

29 THE COMMISSIONER: Q Well, short of evidence  
30 of a leak or a rupture, that would occur during



Banfield, Gunn, Hemstock,  
McCart  
Cross-Exam by Bell

operation maintenance but during the construction period, what kind of evidence would you require. Let us suppose that there was demonstrated mortality. What evidence would you require that that was caused by pipeline construction? Assuming that there was no other ascertainable cause. Am I making myself clear? We're asking you to go a little far but it's a very interesting and important question. It may turn out to be.

A You see, the problem is that if there is some change in the pattern regardless of the reason for the change, the pattern of catch, it's going to be blamed on the pipeline in any case.

Q Right.

A And I think the difficulty is that you have to have fairly secure evidence that some aspect of the pipeline construction was involved. I think you would have to have some dead fish in hand and you would have to be able to examine them or examine the circumstances in which the fish died to establish that it was in fact the pipeline.

MR.BELL: Q Well, you might not necessarily have to have dead fish would you? It might have been caused by some damage to eggs, for example.

A It might have. One of the great difficulties in working with those fish in Peel River is that by and large I think the catch consists largely of ciscos and we don't know really how



Banfield, Gunn,  
Hemstock, McCart  
Cross-Exam by Bell

big the cisco population is and secondly we really don't know where they spawn and the distribution of spawn or the distribution spawning areas. We know that they are in the head waters of the Peel River somewhere.

Q So, you would want to know the spawning areas, the overwintering areas of the --

A If you wanted to establish a case that in fact there was damage and if it had been the result of some pipeline related activity. You may want to know that. You may not. I mean, obviously, if there is a blow up of the pipe in the middle of the Peel River and you find millions of dead ciscos downstream, I think that's pretty reasonable evidence that there has been a mortality which is directly related to some pipeline function.

But if the only evidence you have is that in one year, people caught fewer fish than they caught over an average of the previous ten years, you don't have that kind of certainty because we have (a) very little knowledge about the total size of those populations and I must say it would be extremely expensive to get that information and (b) We don't know what the natural fluctuations in populations level are. We couldn't distinguish -- if all we knew was that the catch fell in one year, we couldn't distinguish between pipeline related mortality and natural fluctuations in population size,



Banfield, Gunn,  
Hemstock, McCart  
Cross-Exam by Bell

1 the loss of a year class couldn't possibly occur as a  
2 natural event.

3  
4 Now, with some change  
5 in the size of the population which may continue for  
6 a number of years until that particular age group passes  
7 out of the population.

8 THE COMMISSIONER:

9 Q Let me ask you a question  
10 about this. I think you're quite right. If you build  
11 this pipeline, the people at Fort McPherson will  
12 observe the obvious impact of pipeline activity, the  
13 construction project itself and the building  
14 of a river crossing and they will, if in the year or  
15 two years following that they find they are not  
16 catching as many cisco as they did the year before,  
17 they'll blame the pipeline construction.

18 Probably you would too  
19 if you were living there. Now, if we used conventional  
20 ways of assessing, of awarding damages, we would say  
21 to them, "all right, now prove your case." Well, first  
22 of all, they wouldn't even be able to prove in a way  
23 that's acceptable to you, what the population was the  
24 year before, the year before that, and so the initial  
25 data base is not there so you would have to devise,  
26 it seems to me, some kind of procedure that would  
27 enable them to have a reasonable chance of proving  
28 their case, short of an incident that left no room for  
29 argument like a blow-out and that kind of thing.

30 That's the difficulty  
up  
you're against here and it's one of the things we have



Banfield, Gunn,  
Hemstock, McCart  
Cross-Exam by Bell

1  
2 to sort out before we're through. I was interested  
3 that on the north coast you seem to have a pretty good  
4 knowledge of the fish populations there but on the  
5 Peel you don't and nobody does.

6 A Part of the problem is,  
7 of course, that on the North Slope you are working with  
8 relatively clear streams where you can count the fish  
9 from the air and get some kind of a reasonable estimate  
10 of how many there are. In the Peel we're working with  
11 a rather more turbid river and the other problem is  
12 that you are working with ciscos to a large extent and  
13 ciscos are very vulnerable to damage through handling.

14 They lose scales very  
15 readily. There's a relatively high mortality I would  
16 expect from handling and tagging and things of this  
17 sort. Now, you could get a population estimate by  
18 doing a mark and recapture program. If you can  
19 devise some method of capturing them in a weir or a  
20 trap of some sort that you minimize the amount of  
21 damage but it is a difficult thing to work in a river  
22 like that and to get a reasonable estimate of what's  
23 there.

24 THE COMMISSIONER: Well, carry  
25 on, Mr. Bell. Sorry to interrupt you.

26 MR. BELL: Even when  
27 I have questions I don't get to ask them.

28 THE COMMISSIONER: That's  
29 because your questions are always so terrific that  
30 they always make me think of questions.



Banfield, Gunn,  
Hemstock, McCart  
Cross-Exam by Bell

MR. BELL: That's fine.

THE COMMISSIONER: I never  
get to ask questions either. I'm entitled to ask some.

MR. BELL: I would assume  
that you would want to also know whether the pipeline  
company had adhered to whatever mitigative procedures  
were required?

A Yes.

Q You would want to know  
the size of the previous catch.

A Really what you are  
interested in is the catch per unit effort, you know,  
because it's the same number of people and the same  
number of nets aren't set every year so you have to  
know how many fish were caught within a certain week  
of the year in 1975 per net.

Q Do you know if any  
records were kept of that?

A No, not specifically,  
for the Peel River, no.

Q Well, there's no commer-  
cial fishing or anything like that there, is there?

A There seems to be very  
little hard data on domestic fisheries as to who caught  
what where. We have reviewed the literature on the  
subject and this is the document we have made available  
here but there had not been very many detailed studies  
of this kind of thing.

Q When you say catch per



Banfield, Gunn,  
Hemstock, McCart  
Cross-Exam by Bell

unit effort, to you mean that you would know the  
fishing techniques that were used, the size of the  
nets, how many, where they were located, how long they  
were left in the water.

A Yes.



Banfield, Gunn, Hemstock, McCart  
Cross-Exam by Bell

1 Q It's conceivable, isn't  
2 it, that the issue could also be more confused by the  
3 fact that the Dempster Highway crosses the Peel River  
4 upstream of this location.

5 WITNESS McCART: Very much more.

6 Q I believe you said that  
7 the danger or the risk of siltation from roads is a  
8 serious one.

9 A Well yes, in general.  
10 Now the Peel River is highly turbid to begin with. I  
11 would think that one of the things that is likely to  
12 arise as a result of the fact that you have a highway  
13 there is that other people can enter the area who might  
14 not traditionally have used it, can jump into a pickup  
15 truck and move into the area and fish an area that  
16 they might not have done, where they might not have fished  
17 in the past. So you might get additional fishing in the  
18 area as a result of the fact that you have access.

19 Q So conceivably the pipe-  
20 line company could say, "It wasn't us but the Dempster  
21 Highway."

22 A Right. I should point out  
23 that one of the reasons we're doing our work in the  
24 vicinity of Chick Lake is that we are trying to -- we  
25 originally established this monitoring location because  
26 we felt that or thought at the time that the Mackenzie  
27 Highway would be crossing it and we would be in a  
28 position then to look at the relative impact of the  
29 highway versus a gas pipeline construction. It looks  
30 as if now, however, with the highway delayed, that we



1 aren't going to be able to carry this out in a way that  
2 we had originally proposed.

3 Q Well, where then does  
4 that leave us? Perhaps I could ask Mr. Hemstock this  
5 question. As I recall Mr. Horte's evidence, in response  
6 to a question by Mr. Anthony concerning compensation,  
7 my impression of what he said was that any claims for  
8 compensation would have to be dealt with in the usual  
9 way, which I assume means that the claimant would have  
10 to prove his case to some sort of balance of probabili-  
11 ties in order to be compensated. It appears that  
12 in a case even though the claim may be justified, in  
13 a case, it would be impossible to prove it. Is there  
14 any way around that? Can we deal with that by devising  
15 some other procedure perhaps?

16 WITNESS HEMSTOCK: I certainly  
17 don't have any solutions to the problem. We recognize  
18 that there is a problem there. I don't recall just how  
19 Mr. Horte put it, but I look on these resources as a  
20 harvest, very much the same kind of a harvest as you  
21 have in say farming country in the south, where damages  
22 are paid for, the damage which may occur on the right-  
23 of-way. Now we would intend to -- in fact we have had  
24 it in our budget but not yet started it -- what we  
25 call a resources study to look at these things and  
26 as Dr. McCart has said, it's a very difficult thing  
27 and I'm not sure that we will get anywhere with the  
28 study itself. It's just a difficult problem.

29 I think that in the case of  
30 furbearers, it's probably more amenable to a study and



Banfield, Gunn, Hemstock, McCart  
Cross-Exam by Bell

1 conclusion, then in the case with fish, particularly the  
2 example you picked, of the key areas might be several  
3 hundred miles from a pipeline and there could be well  
4 many other affects on those fish before they arrive  
5 at the Peel crossing.

6 Q What would you think about  
7 shifting the onus so that if damage could be proved  
8 that the onus would then shift to the pipeline company  
9 to prove that it didn't cause it? Or perhaps we  
10 could remove it from an adversary type of situation  
11 altogether and have some sort of automatic payment for  
12 loss which would be financed, I suppose, by -- in  
13 the same way as insurance would be financed. Are those  
14 measures you'd be willing to consider?

15 A Yes, I think we'd consider  
16 any kind of a measure would lead to that kind of  
17 solution. Perhaps a Board could be set up with a  
18 member from the government, the pipeline company, and  
19 local people, a 3-member Board to take a look at the  
20 problem and make a recommendation.

21 MR. BELL: Those are all the  
22 questions I have, thank you.

23 THE COMMISSIONER: You might  
24 consider, Mr. Bell, whether, if certain requirements  
25 were laid down that the pipeline companies had to  
26 fulfil, in relation to the protection of fisheries,  
27 and it were shown that they hadn't done what they were  
28 supposed to do, then unless they could show there was  
29 some other cause for the loss of fish population, the  
30 loss of the fish population, they had to pay. That would



Banfield, Gunn, Hemstock, McCart  
Cross-Exam by Bayly

1 be the end of the matter. That provides an inducement to  
2 them to adhere to whatever requirements are laid down  
3 and it is a way of implementing your suggestion about  
4 reversing the onus. At any rate you might think about  
5 that and we'll get to it sooner or later in argument.

6

7 CROSS-EXAMINATION BY MR. BAYLY:

8 Q Dr. McCart, following up  
9 Mr. Bell's line of questioning, and perhaps for some  
10 time, I take it from your answers to his hypothetical  
11 situation that it would be true to say that there are,  
12 along the pipeline routes, prime and alternate, knowledge  
13 gaps on fisheries with regard to certain species and  
14 certain areas that you recognize

15 WITNESS MCCART: Yes.

16 Q If I may refer to a volume  
17 called:

18 "A further evaluation of fish resources of  
19 the Mackenzie River Valley,"  
20 prepared by the Environmental Social Committee on North-  
21 ern Pipelines, June, 1974, at page 91 where they talk  
22 about knowledge gaps -- do you have that volume, sir?

23 A No, I don't have that.

24 Q Are you familiar with the  
25 volume?

26 A I've browsed through it,

27 Q Let me read their apprai-  
28 sal of knowledge gaps, and I invite you to either  
29 agree or disagree with it, or at least comment on it,  
30 and it's found at page 91 under paragraph 14.1,



Banfield, Gunn, Hemstock, McCart  
Cross-Exam by Bayly

1 "knowledge gaps".

2 "Results from the first three years of study  
3 of the Mackenzie River fish resources have  
4 provided data for most species on length wave  
5 relationships, age and growth, food habits and  
6 sex ratios. Baseline data on fish contamination  
7 levels were obtained in 1971. The tagging  
8 program in 1972 and 1973 has provided much inf-  
9 ormation on migration routes and times. Fry  
10 traps have aided in determining movements of  
11 fry and juveniles. However, knowledge gaps  
12 still exist in life history details for adults  
13 and juveniles of several species. Spawning  
14 grounds located to date have been mainly limited  
15 to those within reasonable distances from base  
16 camps. The locations of other spawning areas  
17 in the headwaters of tributaries remain unknown.  
18 Although small streams are known to be important  
19 nursery areas, numbers of fish utilizing these  
20 streams in critical periods have not been  
21 established. Additional data must be collected  
22 on spawning habits and juvenile life histories  
23 if these critical stages are to be protected  
24 during pipeline construction."

25 I'm going to skip a paragraph now.

26 "There is also a current lack of information  
27 on overwintering areas. Since pipeline con-  
28 struction activities will occur primarily  
29 during winter months, it is imperative that  
30 these gaps be filled prior to construction."



Banfield, Gunn, Hemstock, McCart  
Cross-Exam by Bayly

1 Now that's a large question  
2 and covers a large number of species, but in general  
3 would you agree that for some species anyway that that  
4 appraisal of the knowledge gaps in general is correct?

5 A For some species, yes.

6 I'd say for instance ciscos and white fishes in some  
7 of the streams in the Mackenzie Valley we would like  
8 more information.

9 Q Let's go into some of  
10 those species and I'll be referring to a volume from  
11 the Beaufort Sea project called:

12 "Movements, distribution, population and  
13 food habits of fish in the western coastal  
14 Beaufort Sea."

15 Do you have that volume, sir?

16 A No.

17 Q This, I believe, is also  
18 entitled:

19 "Interim Report on Beaufort Sea project Study  
20 B-1 (Western), December, 1974."

21 At page 5 of this report --

22 A I haven't got it. Go  
23 ahead.

24 Q All right, it's probably  
25 easier for the Commission if I do read it, in any  
26 event, Under the heading:

27 "Current state of knowledge,"  
28 item 3, the following things are said about a number  
29 of species, and I'll go through them.  
30



1 To begin with, least cisco, and at the bottom of the  
2 page a paragraph reads:

3 "Due to the increasing abundance of least  
4 cisco towards the Mackenzie River, it has  
5 been suggested that they constitute a segment  
6 of the Mackenzie spawning stock (Mann, 1974,  
7 Craig & Mann, 1974)."

8 It doesn't seem to get beyond the suggestion level  
9 and would you agree that with regard to that --

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1  
2 A Yes, let me point out that  
3 Mann and Craig are both employees of my company and that  
4 we have studied least cisco. There is another  
5 discussion of the distribution of these things along  
6 the Beaufort Sea coast in a thing called, by P. Craig  
7 and myself, a paper that was delivered at a symposium  
8 in Alaska this summer which summarizes the information  
9 on these species and many of those other anadromous  
10 sea-going species that are distributed across the  
11 Beaufort Sea. Our feeling now is that the least cisco  
12 that are found along the Beaufort Sea coast in the Yukon  
13 do originate in the Mackenzie drainage, move west along  
14 the coast during the course of the summer.

15 However, they don't move as  
16 extensively as the Arctic cisco because there are certain  
17 portions of the Beaufort Sea coast where we simply  
18 do not get least cisco. If we go far enough west--

19 Q And I know as a scientist  
20 you pick your words very carefully when you say we feel.  
21 you are in an area where you have some data but where you  
22 aren't at the position where you can say we know or we  
23 can conclude. Would that be fair to say?

24 A Well, it depends on what  
25 you mean. We know that there are no least anadromous  
26 populations, least cisco spawning in any of the  
27 streams that we have investigated across the Beaufort  
28 Sea coast, with the exception of a few land-locked  
29 populations. So, they are not spawning in the Firth  
30 River, the Malcolm or the Babbage or any of the streams



1  
2 on the Alaskan side including the Sagavanirtok River.  
3 It has never been demonstrated that that species occurs  
4 in any of these as anadromous populations returning to  
5 spawn. They are found in the Colville River in Alaska,  
6 which is the largest drainage in the North Slope in  
7 Alaska and they are found in the Mackenzie. We are  
8 very certain that the fish that we take along the coast  
9 come from one or the other of those two locations  
10 because they seem to have limited dispersal along the  
11 Beaufort Sea coast during the summer.

12 We feel that those that are  
13 taken along the North Slope of the Yukon almost certainly  
14 originate in the Mackenzie drainage.

15 Q All right.

16 A As far as their spawning  
17 over wintering areas goes.

18 Q All right. Has the state  
19 of knowledge on this increased from what is reported on  
20 page 6 again from, "Mann 1974" , and Stein and others  
21 1973? Quoting from the first paragraph, "The locations  
22 and frequencies of spawning have not been determined  
23 for Mackenzie River least cisco". Is that still the  
24 state of knowledge?

25 A To my knowledge that's true.

26 Q And down at the next para-  
27 graph the following statement again from "Mann 1974"  
28 and from McFale and Lindsay 1970, "Fry hatch in the  
29 spring but unfortunately very little is known of their  
30 distribution movements or feeding habits".



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A Is that a question?

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Q I am asking you if that's true? If that is the state of knowledge at the present with regard to fry hatch distribution?

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A That's generally true as far as the anadromous species, the anadromous populations go.

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Q Right. Now let's move on to Arctic cisco and I am trying to confine my remarks to fish that are very probably the most important species for domestic fisheries in the area concern of my client.

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Now at page 7 of this report under 3.2, first paragraph, second sentence,"(Craig and Man1974) have suggested that these fish belong to the Mackenzie River spawning stocks and upstream distribution in the major rivers of their study area, eg. Babbage River, rarely exceed one kilometre", and this was what you were referring to--

21

22

A What was that about one kilometre? I missed that.

23

24

Q Rarely exceeded one kilometre.

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A What did?  
Q Let me read the sentence again. "(Craig and Man 1974) have suggested that these fish belong to the Mackenzie River spawning stocks and upstream distribution in the major rivers of their study area, eg. Babbage River, rarely one kilometre".



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A Right.

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Q And is that the state of knowledge at the present on the distribution? We are at the stage where we have in this report the word that they have suggested?

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A Well the same <sup>situation</sup> / is true with the Arctic cisco. We know of no Arctic cisco populations spawning in any of the streams that we have examined, some of them in considerable detail between the Mackenzie River and the Colville River.

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We know that there is a spawning population in the Colville River and we know that there are spawning populations in the Mackenzie. But no one has ever demonstrated that they existed any point in between, except that they do make short excursions upstream like the Babbage, during summer to feed, but presumably move back downstream and move back over to the Mackenzie to over-winter.

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Q All right. And this is reported by Craig and Man again in the next paragraph 1974 and I invite you to agree with this statement that, "The spawning habits of this species are poorly understood. Sexual development in females approach completion as early as mid-July and upstream spawning migrations in the Mackenzie River occur from July to September inclusive".

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A Yes.

Q And the report goes on to say,

"Although McFale and Lindsay 1970, have reported that



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1  
2 spawning occurs over gravel in fast water sections  
3 of streams. Actual periods and locations of spawning  
4 are not known for Arctic cisco in the Mackenzie River".  
5 Has the state of the knowledge since that 1970  
6 report changed?

7 A That's right, yes.

8 Q But that is the state of  
9 knowledge at present?

10 A That is the state of know-  
11 ledge at present, yes.

12 Q And at page eight of that  
13 report, "Information on the distribution movements and  
14 feeding habits of fry and juvenile is lacking . It has  
15 been speculated that fry are washed downstream to the  
16 delta", bracket "s" in brackets assuming there is more  
17 than one delta, "during the spring flood, Craig and Man  
18 1974". Is that the assumption that is still made.

19 A Well in that instance we  
20 have been picking up ciscos in the delta during the  
21 course of our cross-delta studies, juvenile ciscos and  
22 I think some young of the year. As I pointed out earlier  
23 those data are still being analyzed and I think that is  
24 essentially true. Of course, we are garnering more  
25 information as we go along.

26 Q All right. So, we have got  
27 now past the stage of speculating because you have been  
28 able to pick up some of these things in cross-delta  
29 assessment work but that the report/<sup>which</sup>will perhaps be  
30 able to analyze this official data will be available at



1  
2 a later stage and perhaps before this Inquiry--

3 A For the delta area, yes.

4 Q For the delta. Now  
5 I am going to mention that Arctic char is referred to  
6 in this chapter but not go through that because  
7 we have gone through a lot on Arctic char and I would  
8 suggest that your knowledge of Arctic char is at a  
9 higher level than it is of a lot of other fish in the  
10 area that you studied?

11 A Yes.

12 Q That doesn't mean that you  
13 may not want to do more work on them but it's certainly  
14 one of the intensive areas of study that you have  
15 carried out?

16 A Yes.

17 Q Now, the Inconnu which is  
18 referred to at page 11 under 3.4, last paragraph,  
19 "Little information is available regarding the spawning  
20 habits of Inconnu. The young presumably emerge in the  
21 spring and may be carried in the spring flood to the  
22 lower reaches of rivers or into brackish water", Stein  
23 and others 1973. Now has the/<sup>state of</sup>knowledge on Inconnu with  
24 regard to spawning habits been added to since that  
25 statement made by Stein and others?

26 A Not as far as spawning habits  
27 goes. Again, we may have picked up young Inconnu in  
28 the delta.

29 Q So, we may find that there  
30 is some analysis, some data from this summer which will



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1  
2 help increase the body of knowledge on that species.

3 A Yes.

4 Q Humpback white fish, page  
5 12, 3.5, second paragraph, "The humpback white fish  
6 is known to enter brackish waters", McFale and Lindsay  
7 1970, Scott and Crossman 1973. "Little information is  
8 available about the spawning habits of this species in the  
9 coastal areas. However, it is believed that an upstream  
10 spawning migration occurs in mid-Autumn", (McFale and  
11 Lindsay). Is that the state of knowledge with regard  
12 to the spawning habits of this species at present?

13 A I don't know what-- The  
14 situation is this, that there is more information than  
15 that on the upstream migration, timing of upstream  
16 migration of that particular species.

17 Q So it has been pinned down  
18 to something--?

19 A Yes.

20 Q --in terms of periods of  
21 various months rather than mid-Autumn?

22 A We have further data as a  
23 result of our own cross-delta studies as to the timing  
24 of the upstream migration of that particular species.  
25 And incidentally I should point out all of the preceding  
26 species.

27 Q Would you say that last line  
28 again.

29 A All of the preceding species,  
30 the ciscos and inconnus.



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Q But with regard to the spawning habits, that is still the state of knowledge, that little information is available regarding the spawning habits of these fish, the humpback white fish?

A I suspect that there are further data available of spawning populations which frequent lakes in the vicinity of the pipeline route.

Q Yes. May I point out in this volume, Mr. Commissioner and invite Dr. McCart to agree with me that in, on page III under acknowledgements, in the second paragraph, "Dr D.N.

Gallup , University of Alberta, analyzed the April survey water samples Dr. P. McCart of Aquatic Environments Ltd. provided valuable assistance in a literature search and in comparing techniques on the aging of otoliths which I believe are the ear mechanism of the fish. Correct?

A That's right, yes.

Q So, you participated in the literature research for this group. Is that correct?

A I suppose I did, if you say so.

They  
Q / certainly thank you for it in any event.

A I think I had better make a point here. You see we had a de facto agreement with the Federal Government Fisheries Service but we would concentrate our activities on the North Slope and on the smaller drainages entering the Mackenzie River.



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1  
2 And if you look at the sources  
3 of information on the Peel and the Arctic Red and the  
4 Mackenzie River itself, and most of the work up until  
5 this summer was done on the Mackenzie Delta, these are  
6 done by the Federal Fisheries Service and they have put  
7 in many years of work on all of these species.

8 Now, the difficulty is, of  
9 course, that it is very difficult to get information on  
10 some of them. You can't see them up there spawning and  
11 the spawning grounds, we suspect, are considerably up-  
12 stream of any pipeline crossing.

13 We had not concentrated on  
14 larger streams to begin with except for our recent work  
15 in the Mackenzie Delta.

16 Q All right.

17 A And our concern is with  
18 the Arctic char and the species that inhabit the North  
19 Slope and we certainly know a considerable amount about  
20 all of those species as they occur, both in near shore  
21 areas and in streams across the North Slope.

22 And where they occur in the  
23 smaller drainages, tributary to the Mackenzie, but we  
24 have not in fact looked at them in the Peel and the  
25 Arctic Red and the Mackenzie River.

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Banfield, Gunn, Hemstock, McCart  
Cross-Exam by Bayly

1 Q I'm in no way aiming this  
2 as criticism at anyone, Dr. McCart. I'm trying to find  
3 out the state of knowledge on various fish and whoever's  
4 responsibility it is, I think it's useful to bring this  
5 out and I don't mean to suggest by this line of  
6 cross-examination that I'm in any way critical of your  
7 work. I just wanted to find the areas in which you  
8 concentrated and the state of knowledge with regard to  
9 other fish that are certainly important to people that  
10 I represent.

11 A O.K., and I would like to  
12 also make the point that we have looked at these fish  
13 as they occur in the vicinity of crossings particularly  
14 through the delta. We know when they pass by. We have  
15 some information on the possibility that they might  
16 spawn in those area, but it's true we haven't looked 40  
17 miles upstream to see exactly where their spawning  
18 grounds are.

19 Q Yes.

20 A Unless it's apparent that  
21 there may be a spawning ground in the vicinity or  
22 particularly downstream of it.

23 Q Well, if we can then get  
24 back to the old humpback whitefish, because it illustr-  
25 ates one of the other gaps that maybe, may exist, and  
26 that is with regard to the whole aquatic ecosystem on  
27 which they depend, and there's a paragraph on page  
28 13 of this report outlining their feeding habits.  
29 The paragraph reads:

30 "This species is usually a bottom feeder, but



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1 may also feed on planktin (McPhail & Lindsay, 1970 ,  
2 Scott & Crossman, 1973). The diet of adults varies  
3 from region to region but consists mainly of  
4 mollusks, anthropods, aquatic insect larvae, and  
5 occasionally small fish and eggs (McPhail & Lindsay,  
6 1970, Scott & Crossman, 1973)."

7 Is that, to your knowledge, the  
8 state of knowledge about the feeding habits of the  
9 humpback whitefish?

10 A Well, humpback whitefish  
11 is also called the lake whitefish and it's the whitefish  
12 and it is distributed throughout the cold water lakes  
13 throughout North America, and there's an enormous  
14 amount of information available on humpback whitefish.

15 Q All right, well let's  
16 get more specific then. Is the state of knowledge on  
17 what they actually feed on in the Mackenzie Delta area,  
18 the North Slope either east or west of the Mackenzie,  
19 and the rivers that they inhabit when they have completed  
20 or during their migrations, have these been studied to  
21 an extent which would tell us what they feed on and  
22 depend on?

23 A Well, you see, the  
24 difficulty with food habit studies in fishes is that  
25 you find that the fish eat whatever is available to them.  
26 All of these Arctic species are very resilient. If there  
27 are no mollusks to be eaten, they'll eat anthropods, and  
28 if there are neither of those they'll eat plankton, and  
29 if there are neither of those they'll eat surface  
30 insects. So I'm not too concerned about the fact that



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1 we dont know what they happen to eat in any particular  
2 circumstances because they're going to eat whatever is  
3 available to them.

4 Q I can understand them  
5 eating everything that is available to them. Would  
6 you agree with me, though, that it's important to  
7 know what range of things they eat because there are  
8 various downstream effects, for example, caused by  
9 siltation on a variety of things they eat, they may  
10 find they're in great competition with other species  
11 for what's available.

12 A I think it's a very  
13 complicated subject and I'm not sure that a lot of  
14 food habit studies are very informative.

15 Q Well, I accept that it's  
16 a complicated subject, Dr. McCart, and you may just  
17 be telling me that there is no simple answer to this.  
18 All I'm asking is if the entire system of things that  
19 are eating and eaten are inter-dependent to such an  
20 extent that we could end up with a situation like the  
21 one that Mr. Bell outlined to us, where we might never  
22 know what caused --

23 A Well, certainly if the  
24 ecosystem is changed, the habitat is changed in some  
25 way so that it affects the integrity of the ecosystem  
26 in which the fish are living, in affecting food avail-  
27 ability of various food organisms. This is certainly  
28 going to affect the fish.

29 Q I'm just coming in at the  
30 back door then of what you answered to Mr. Bell, that



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1 if you were the man sitting to try and determine the  
2 cause of a drop in population, you would have a diffi-  
3 cult time because of these types of problems.

4 A I would say that one of  
5 -- it's much more important to know something about  
6 population size than to know what the food habits  
7 happen to be.

8 Q All right .

9 A Incidentally, let me go  
10 back again. I am not certain that there isn't an awful  
11 lot of information about what humpback whitefish are  
12 eating in let's say the Richards Island area, the  
13 delta and in the channels. Certainly we have that  
14 kind of data for this summer, and I suspect if we  
15 look at other studies we'll find that there is also  
16 data available in other studies.

17 Q And that would be coming  
18 out in your cross-delta --

19 A Our data will, yes.

20 Q Beg pardon?

21 A Our data will, yes.

22 Q Yes.

23 A And an analysis possibly  
24 of whatever else is available.

25 Q Yes, you don't do this  
26 in a vacuum, if somebody else has already done some  
27 of the work, you assess it and if it's useful you  
28 refer to it. Correct?

29 A Yes.

30 Q Now, almost the identical



1 types of things are said about the broad whitefish, so  
2 I won't go into that, but again that's another of the  
3 species which local people use both for themselves and  
4 for their domestic animals.

5 A And other species for  
6 which we are currently generating some data.

7 Q Yes. Now, you stated that  
8 the main important thing to do with regard to these  
9 various fish that are more difficult to study, and  
10 therefore the level of knowledge is not as high on,  
11 is to find out what the populations really are, and  
12 would you say that that is a knowledge gap that you'd  
13 like to see filled?

14 A No, no. I was talking  
15 about, if you want to establish damages, O.K., you have  
16 to know what size a population was. If you want to  
17 protect the fishery, you've got to assure yourself  
18 that there aren't critical areas in the vicinity of your  
19 pipeline crossing, so that we confine ourselves to some  
20 extent to the vicinity of the pipeline crossing,  
21 particularly areas downstream. Is there evidence  
22 that humpback whitefish or Arctic cisco are spawning  
23 downstream of the pipeline, are they migrating through  
24 a channel which might be affected by the pipeline, if  
25 so at what time? It's true I don't know where the  
26 Arctic cisco are spawning in the Mackenzie system,  
27 and neither does anybody else, and some people have  
28 spent an enormous amount of money studying the Mackenzie  
29 system searching for these things.

30 Q Well, what --



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1                   A     I have to assure myself  
2     that it isn't in the vicinity of the pipeline in an  
3     area where they might be affected. If they are 400  
4     miles away during a spawning period, it's of very little  
5     concern to me. If they're migrating through the area  
6     in which the pipeline is located at a time when pipeline  
7     associated activity might be taking place, then I am  
8     concerned. But I am not worried about where inconnus  
9     spawn, I can tell you that inconnu have probably the  
10    most stringent spawning requirements of any species,  
11    that they spawn in very localized areas, in relatively  
12    large rubble and things like this. This is what has been  
13    shown in Alaska, for instance, and it would appear  
14    to be very few of these areas like this anywhere in  
15    the vicinity of the pipeline.

16                   Q     Well, could we then  
17    characterize what you do is not to find out where the  
18    spawning areas are of the ciscos but to try and determine  
19    where they aren't? For the purpose of --

20                   A     I want to know whether there  
21    are critical areas for ciscos in the vicinity of the  
22    pipeline.

23                   Q     All right. Now, without  
24    --

25                   A     Incidentally, I do know where  
26    some ciscos spawn. They spawn in Trout Lake.

27                   Q     Yes.

28                   A     And we had a shot of Trout  
29    Lake yesterday in the movie.

30                   Q     Now I can appreciate that



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1 you know where some of them spawn and that you say,  
2 "Well, those don't matter because they are a long  
3 way away."

4 Now, is it difficult to  
5 assess not only where they spawn, but how significant  
6 pre-spawning activities are with regard to some  
7 species because the spawning habits aren't properly  
8 --

9 A You mean the behaviour?

10 Q I don't mean the actual --

11 A Migratory behaviour in  
-12 getting to the spawning grounds?

13 Q You are assessing that?

14 A Yes.

15 Q All right.

16 A We will have a fairly  
17 reasonable idea from our own and other people's work  
18 as to when they might pass through channels in the  
19 Mackenzie River on their way to spawning grounds.

20 Q How wide a corridor do  
21 you study to determine to your own satisfaction whether  
22 you have a pipeline crossing, for example, in an area  
23 that may be a spawning area?

24 A Well, that kind of  
25 depends on the situation, the species we're looking at.  
26 In some cases we've moved as far as 60 miles away from  
27 the pipeline to find out where critical areas might be.

28 Q And with those species  
29 on which you have a hard time finding them because  
30 the water is turbid, it's very difficult to track their



Banfield, Gunn, Hemstock, McCart  
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1 movements or the time of their movements, is that  
2 correct?

3 A Well, it's not difficult  
4 to track the timing of their movements because they're  
5 very susceptible to gill-net capture. You can't see  
6 them but they can see your gill-net. But we have a  
7 pretty good idea when they're moving through these  
8 areas. Now let me point out that that is true for the  
9 upstream migration of the spawning grounds, but the  
10 business of trying to find out when the young move  
11 downstream is infinitely more difficult.

12 Q Sure, anything that  
13 will go through your gill-nets, you won't find. They  
14 can't see you and you can't see them.

15 A They move down during  
16 spring food, you see that has a protective function  
17 among other things, and they are very tiny, and those  
18 -- the timing of the downstream movements is unknown.  
19 As a matter of fact, we've had great difficulty finding  
20 out and getting this kind of information for Arctic  
21 char when they move to sea.

22 Q You have the one advantage  
23 ~~there~~ that when you fly over in an airplane in a  
24 clear water river you can see some of these.

25 A No, we don't have that  
26 advantage, because they like everything else, they move  
27 <sup>that are</sup> downstream, the young /going to sea for the first time  
28 are moving downstream in turbid waters. This is what  
29 makes it difficult. There is the advantage, however,  
30 that they are much larger because they don't go down



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1 stream as fry; they go downstream at age 3 to 6, or  
2 something of this nature when they're considerably  
3 larger.

4 Q With regard to fish  
5 counts, do you use local people's success or lack of  
6 success at various spots in fisheries to help you  
7 determine whether or not there are significantly large  
8 populations to concern yourself with?

9 A Only in the sense that  
10 normally people fish where there are regular supplies  
11 of fish at certain times of the year.

12 Q So that localizes it to  
13 a certain extent, and do you take counts of the catch  
14 that they make in your assessment?

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Banfield, Gunn,  
Hemstock, McCart  
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A We have only done that  
at Barter Island. It's the only place we have carried  
out a study of that kind.

Q There are other signifi-  
cant fish areas though, you would agree?

A Yes.

Q Now, I would like to take  
Mr. Bell's example out of the adversary process that  
he did and suggest that we may not be faced with people  
saying "give us money for fish that have been lost" but  
people saying "is it possible to replace the fish that  
for some reason have disappeared, whether it's related  
to the pipeline or not and have you done studies to  
determine whether or not you can successfully restock  
some areas or restock some populations, if for some  
reason, either related or not related to the pipeline  
they start to dwindle.

A We haven't done specific  
studies, no, but I think there is an abundant literature  
on the subject and for some species it's probably quite  
easy to restore a population which may have been  
destroyed and other species, it is probably extremely  
difficult.

Q And is it easier for,  
to replace species in general and maybe there is no  
general answer, species that go to sea and species  
that don't or vice-versa?

A I would say it's probably  
easier to replace populations in lakes where you have



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1 a resident population as opposed to anadromonous  
2 populations, yes.

3 Q Right. So char and  
4 grayling and some of the whitefish and the cisco might  
5 be quite difficult in that they travel.

6 A Grayling don't normally  
7 go to sea. They are very intolerant of saline condi-  
8 tions.

9 Q Yes, they do travel  
10 about in the streams, though.

11 A Oh yes. They migrate  
12 a considerable distances in streams.

13 Q Right. I said travelling  
14 because you had said that lakes are easier to stock  
15 than areas where fish move about.

16 Now, in order to find  
17 out whether you could do that sort of restocking if it  
18 became necessary or not necessarily you, but that it  
19 could be done. May I suggest that you would have to  
20 know more about the life history, life cycle of the  
21 various species or species that you are concerned with.

22 A Well, it depends on  
23 which species. I mean, if we were concerned with  
24 restocking with Arctic char, we know enough about the  
25 life cycle to know where to go to get the eggs and  
26 when. I'm sure that we know that we have that kind  
27 of information for grayling for most of the areas.

28 Q Right. What about  
29 cisco?  
30



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Hemstock, McCart  
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A Well, we have a pretty good idea when cisco are migrating upstream to the spawning grounds and it seems to me that it's possible to intercept some of these fish and use them.

Q Right. Is that --

A As sources of eggs or whatever, but I really, honestly, let me tell you, that I don't think that there is very much hope of restoring a decimated cisco population using fish cultural techniques.

Q Would you say that they are less resilient?

A I would say they are far more difficult to deal with because, in hatcheries, their success with propagation of whitefish in general and of which ciscos are a member of that family has not been terribly successful in the past.

Q And with regard to inconnu, it sounds as though they need particular conditions. Have attempts been made to your knowledge to reproduce that species in captivity?

A Not to my knowledge, no. The obvious approach is to avoid doing any significant damage to populations rather than attempting to depend on restitution using fish cultural techniques of one kind or another.

Q Certainly, I think we can all appreciate that. I'm only suggesting that these are other things that may have to be considered



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1  
2 not necessarily in pipeline related activities but  
3 in general man related or natural disaster related  
4 activities if there is an important local fishery that  
5 somebody wants to revitalize. You would agree with  
6 that?

7 A Yes.

8 Q Now, you have outlined  
9 that you and the government agreed that the areas of  
10 study should be divided basically. This may be an  
11 over-simplification but that you would concentrate your  
12 efforts on the North Slope and they would concentrate  
13 their efforts on the drainages into the Mackenzie  
14 itself?

15 A No, no. I -- the point  
16 I was making is that the government is concerned about  
17 over-sampling populations and they have a general  
18 policy of apportioning the areas in which people are  
19 doing work. You don't want five different groups  
20 going into the same stream and each sampling fish for  
21 their own purposes and that in general, we confined  
22 our attentions to the smaller tributaries of the  
23 Mackenzie River and the North Slope drainages along  
24 the Beaufort Sea Coast.

25 Q And was this on direc-  
26 tions from the department of the federal government?

27 A This was kind of a  
28 general agreement that we had.

29 Q Yes, and this was to  
30 protect from over-sampling largely, was it?



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A That's right. A large  
part.

Q Well, would that be the  
way you would have suggested that it be done or would  
you have preferred to have done surveys in wider areas  
and I appreciate that you can't study every stream  
because the impact of studying it may be to destroy  
it as a fishery or destroy the fish population but  
given that as a constraint on this type of activity  
would you have preferred to study populations over a  
wider area?

A Well, that's still a  
only  
pretty considerable area. It leaves out the Mackenzie  
itself and some of its larger tributaries. No, I  
felt that that was the appropriate way to pursue this  
thing. We would concentrate our efforts in certain  
areas and they would concentrate their efforts in  
others.

Q Yes.

A Now, on any permit we  
get, they are also additional exclusions because they  
also look at small streams, Oscar Creek, three day  
lake drainage which we did not go into and we were  
excluded from them. Fish River, Big Fish River, sorry,  
was another one. Fish Creek was another one.

Q And these are areas  
where you depend on their data and their sampling to  
assess the possible impact?

A That's right. Yes.



Banfield, Gunn,  
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Cross-Exam by Bayly

Q And with regards to  
the species, would I be correct if my assessment of  
your work was to concentrate on Arctic char and  
grayling perhaps because they were predominant in  
the area in which you studied?

A It happens they  
happen to be the predominant species in the areas in  
which we concentrated our efforts.

Q Are they also by and  
large more resilient species than some of the minority  
populations in the area that you have studied?

A Well, you know, I  
really don't think that we can talk about resilient  
species, more and less resilient.

Q Dr. McCart, you have in  
your evidence throughout your cross-examination talked  
about certain fish species as being extremely  
resilient? The Arctic char being one of them

A Well, I didn't. I  
think I said that Arctic species in general are  
resilient.

Q So you would feel that  
that applies to all the species that are in the area  
of the Mackenzie and the North Slope?

A Yes. I think there is a  
difficulty here in that some people have said okay, we  
can order various species in order of their sensitivity  
that these are sensitive species and these are less  
sensitive species and these are very tolerant species.



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Hemstock, McCart  
Cross-Exam by Bayly

1  
2 I don't like that  
3 approach but if we're talking about resilience, all  
4 of these species have to be fairly resilient.  
5 Otherwise they wouldn't be able to survive in a climate  
6 as changeable as or a regime as changeable as the  
7 one in the Arctic.

8 Q All right. So what  
9 you have said about ciscos being difficult to handle  
10 has nothing to do with resilience in the natural  
11 habitat that they occupy. What it really means is that  
12 they are harder to study because when you take them  
13 out of water they don't survive as well as some of the  
14 other species that are available.

15 A Yes, but that doesn't  
16 relate necessarily to their sensitivity as a natural  
17 population where they are not being pulled out of the  
18 water, handled, tagged and thrown back in.

19 Q All right. I appreciate  
20 that distinction.

21 So you have chosen  
22 two species which respond well to the kind of work that  
23 you did?

24 A No, I chose the species  
25 that were commonest in the -- If you are looking at  
26 small tributaries of the Mackenzie River, you'll find  
27 that the commonest species in there is the Arctic  
28 grayling and if you're looking at the North Slope, you  
29 will find that the two commonest species there are the  
30 Arctic char and the grayling.



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Now, we have done studies on the pond smelt. We have done studies on leak cisco. We have done studies on Arctic cisco. We have done studies on slimy sculpins. We have done studies on four-horn sculpins. We have done studies on very wide range of species.

Q Right and studies that are still going on like the one that Mr. Craig

A Studies that are still going on. We have odelets and weights and lengths for all sorts of species that we haven't gotten around to reporting yet because they are minor species, in the sense that there are not very many of them and because they are only two inches long or something of this sort and don't enter domestic fisheries.

We have these data on file -- wads of it.

Q All right. Well if --

A It's not as if we only did studies on those two species.

Q Oh, I understand that. Is that a priority though of whether they are important for domestic fisheries or are you just as interested in the example we had a week ago, the stickleback which is important for loons but which people perhaps don't eat very much?

A As far as I know we're the only people that have ever done a life history study on nine spined sticklebacks in the vicinity of



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the, on the North Coast in the vicinity of the pipeline.  
Certainly we're interested in them.

Q Yes.

A Because of course they  
form food for other species which are more readily  
utilizable by man.

Q Yes and that would be  
true too of the invertebrate as well as the smaller  
sized fish.

A Yes.



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1 Q Your studies upon  
2 invertebrates, they are found in Volume 15 of the  
3 Biological Report series, Chapter 4, called,  
4 "Effects of disturbance on the benthic  
5 fauna of small streams in the vicinity of  
6 Norman Wells, Northwest Territories."

7 Is that correct?

8 A That's part of it.

9 Q Yes.

10 A A small part.

11 Q Would you say that you  
12 did more research on the fish than on the invertebrates?

13 A To a some extent, yes,  
14 but let me point out that is not the only information we  
15 have on benthic invertebrates. If you look at our  
16 stream catalogues you will find that for most streams  
17 we have examined four or five samples of benthic  
18 invertebrates. We have literally thousands and thousands  
19 of samples which have been analyzed for streams related  
20 to this pipeline here. There's a paper, Craig & McCart  
21 on stream classification which includes further infor-  
22 mation on benthic invertebrates. We have conducted a  
23 study along the Inland Gas Pipeline route as the pipeline  
24 was being put in place, which includes quite detailed  
25 analysis of benthic invertebrate populations and what  
26 happened to them as a result of the pipeline crossing.  
27 Q So you've got information  
28 on some of the downstream or all of the downstream  
29 siltation effects which you could predict for benthic  
30 invertebrates.



Banfield, Gunn, Hemstock, McCart  
Cross-Exam by Bayly

1 Is that how we can interpret --

2 A I have information on what  
3 happens when you cross a stream with a pipeline. I  
4 should point out also that throughout Alberta we  
5 took samples at pipeline crossings of various  
6 pipelines in Alberta and looked at the benthic inverte-  
7 brate populations upstream and downstream of the  
8 crossings which had been made yes, sometime in the  
9 past, so we can do that kind of comparison also.

10 Q All right. Well, we have  
11 in other chapters in Volume 15, I think it's  
12 chapter, the one that covers the North Coast and the  
13 char overwintering populations, etc., definitions in  
14 diagrams and in the text of critical areas for Arctic  
15 char.

16 A Yes.

17 Q Now, have you done that  
18 kind of work for any of the invertebrates? Have you  
19 told the company, for example, "You must stay away  
20 from this area because this is an important hatchery  
21 for stone flies."

22 A Well, benthic invertebrates  
23 don't operate in that way. It is very difficult to  
24 identify a critical area for stone flies. The point is,  
25 I think, that the pipeline crossing in most streams  
26 takes place near the bottom end of the stream, and that  
27 if you do in fact cause some short-term decimation in  
28 the stone fly populations immediately downstream they  
29 will be replenished in very short order by stone flies  
30 drifting down from the upstream areas.



1 Q So the closer you are to  
2 the mouth of the stream, the less potential area for  
3 invertebrates you have to worry about damaging.

4 A That's right, yes.

5 Q And is that a general  
6 statement that we can apply to other invertebrates,  
7 apart from the stone fly, because --

8 A For stream benthic  
9 invertebrates, that would be generally true. But if you  
10 were for instance to drop a toxic chemical in the  
11 very headwaters of a stream you might decimate an  
12 entire population. It would be some time before the  
13 population might be re-constituted by winged individuals  
14 coming in from adjacent areas. But if this were to  
15 occur during the lower portion of the stream, at the  
16 rate at which the population would be re-constituted  
17 would be much more rapid simply because of drift from  
18 upstream areas.

19 Q Well, having said that,  
20 Dr. McCart, you'd agree with me if I were to suggest  
21 that it isn't just the streams, but especially on the  
22 North Slope of the Yukon with regard to the pipeline  
23 routing, the coast itself is an important feeding  
24 ground for a large number of the fish, especially the  
25 ones that come out of the Mackenzie and do their summer  
26 feeding in the pools, the lagoons behind the point  
27 bars, etc.

28 A Yes, I would agree with  
29 that.

30 Q So it may be, and perhaps



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1 you can tell me if you feel that these are areas  
2 in which some potential damage could be done to inver-  
3 tebrates that these fish depend on?

4 A It's possible, yes, and  
5 of course we've been doing -- we've spent two years  
6 looking at sites and among other things, looking at  
7 benthic invertebrate populations. One is in the vicinity  
8 of Nunluk Spit where we did a study in 1974 which  
9 included both benthic invertebrates and plankton popula-  
10 tions, and we have carried out another similar study  
11 at Barter Island this summer.

12 Q Now one of the things  
13 that has me a bit confused with regard to terminology  
14 is, you said for example you did a study.

15 A Yes.

16 Q And I'd ask you to  
17 define that term as it relates to study, count, survey,  
18 and experiment. These are all scientific terms and  
19 I think if we know what those four terms mean, for  
20 example, we can sort out when you say, "I did a  
21 study," what that means in those scientific terms.

22 A Well, some studies are  
23 experimental in nature and include experiments which  
24 may be related to observations in the field, which might  
25 include surveys. They're all very much overlapping  
26 terms. When I say "We did a study," I meant we spent  
27 a considerable amount of time trying to analyze the  
28 situation, as opposed to simply go in for a one-day  
29 look around. That would not be a study, in my terminology.

30 Q All right, when you go



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1 on a study like this, and let's refer to this one  
2 that you did on benthic invertebrates near Nunaluk Spit

3 --

4 A Yes.

5 Q -- could you tell us just  
6 briefly the sort of things that you do so that we'll have  
7 an idea of what you mean by "assessing the situation"?

8 A Well, the study that we  
9 did at Nunaluk Spit is reported in one of the recent  
10 volumes of the Biological Report series, about 200  
11 pages in length. What we did was go in in the spring,  
12 we captured fish, benthic invertebrates, plankton, and  
13 I suspect we did a small amount of phyto plankton  
14 work during the entire ice free season and carried  
15 it on until approximately October when we terminated  
16 that particular study.

17 Q So that gave you an  
18 idea of the propagation of the various invertebrates  
19 in the area, of the algal bloom, of the --

20 A We did not do a great  
21 deal of alga work.

22 Q All right, and the use  
23 that the fish put to the various food sources available.

24 A Yes, it included quite  
25 a detailed analysis of food habits, it also included  
26 a considerable amount of information on the migrations  
27 of various species along the coast. These are, during  
28 summer they migrate coastwise, so we have a considerable  
29 amount of information on the relative abundance of  
30 various species at different catch per unit of effort



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1 data as a matter of fact, at various times of the year.

2 Q So when you do a study  
3 like this and you come back to Northern Engineering  
4 Services with the results, I'm assuming that you make  
5 recommendations based on that. You say, "Don't worry  
6 about it, I don't think you can harm it, whatever you  
7 do," or "Here are the critical problems that methanol  
8 spill or siltation, that gravel borrow or whatever, may  
9 be really important problems that you're going to have  
10 to avoid." Is that how you do it?

11 A That is right, we have  
12 to have baseline data. There are no other data available  
13 for the behaviour of/migration patterns in populations  
14 of near-shore benthic invertebrates for the coast, we  
15 have to generate our own. These are the baseline data  
16 which assist us in understanding what's happening there,  
17 and we will use this as a basis for making recommenda-  
18 tions for mitigative measures during the final design  
19 phase when wharf sites and so forth are, the final  
20 disposition of these is decided.

21 Q So we won't have the  
22 benefit of those recommendations. They will go to the  
23 pipeline company and presumably the regulatory authority  
24 after a permit is granted.

25 A Well, I don't know what  
26 the chronology is.

27 Q Well, you've mentioned  
28 the process of final design, and as I understand it,  
29 and perhaps Mr. Marshall can correct me if I'm wrong,  
30 this is the process that occurs after a permit has been



Banfield, Gunn, Hemstock, McCart  
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1 granted to go ahead to your company. Am I correct  
2 in that, Mr. Marshall?

3 MR. MARSHALL: I think there's  
4 been some indication of some work that's going on that  
5 could be categorized as final design, but I think  
6 you're essentially 99 44/100% accurate.

7 M R. BAYLY: So after doing  
8 a study like this, it gives you some baseline data and  
9 yet it must also tell you that certain things have to  
10 be studied before you can make your recommendations,  
11 unless you feel in some areas that you can already  
12 make them, that you could tell us right here today,  
13 "I would recommend this; I think I have enough informa-  
14 tion to recommend that such-and-such be done."

15 A In a general way, yes, I  
16 could do that.

17 Q All right, so you could  
18 make select recommendations perhaps based on that  
19 study at Nunaluk Spit that was carried out this summer?

20 A They are exactly the  
21 sorts of recommendations and mitigative measures that  
22 were, in a general way, that were included in the appli-  
23 cation. "Don't sediment substrates. Don't spill

24 toxic materials. Don't do this. Don't do that."

25 So you have a benefit now that we didn't have.

26 You now have our information on what's going on at  
27 Nunaluk Spit. So that you're in a position to assess  
28 this yourself.

29 Q All right, so what we  
30 would have to do then would be to go there ourselves



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1 and pour a little methanol on to see what happened  
2 in order to find out if that was a predictable -- if  
3 that was an impact that we'd have to worry about.



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Cross-Exam by Bayly

1  
2 A You can go to the  
3 literature on a subject of methanol and determine from  
4 that what the effects of dumping methanol might be.

5 Q All right. We can find  
6 out the qualitative effects. I would suggest that we  
7 can't find out the quantitative effects in a given area?  
8 Would that be fair to say?

9 A How did we get off on the  
10 methanol? I kind of missed a step here?

11 MR. MARSHALL: I think we can  
12 agree with Mr. Bayly that yes, unless we do go out and  
13 spill the methanol at Nunaluk, that we are not going to  
14 know precisely what the consequences are going to be  
15 of spilling that methanol.

16 But it is probably the sort  
17 of experiment that we wouldn't want to carry out.

18 Q I can understand the  
19 practicalities of that Mr. Commissioner. I am just  
20 asking Dr. McCart if he would agree with me that we  
21 can predict the kinds of impacts, we may not always be  
22 able to predict the extent of impact, no matter how many  
23 pages are in a baseline data report.

24 A Sure. It is true. We are  
25 trying to predict impact. There is no doubt about that.  
26 We are trying to assess the potential impact of the  
27 development. We don't know what the actual impact is  
28 going to be. I don't think anybody pretends to know what  
29 the actual impact is going to be. We are trying to  
30 assess what might happen, we are suggesting mitigative  
measures, but in order to know what the real impact of



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1  
2 the project was, we have to monitor various and sundry  
3 environmental parameters as the development is taking  
4 place.

5 Q All right. So, the great  
6 experiment if I can call it that is the construction  
7 itself. It is what tests your theories and I don't mean  
8 to suggest that they are only theories, it also tests  
9 your baseline data which is arrived at in the most  
10 professional and capable fashion/<sup>that you can,</sup> given that you have  
11 been given as good a quality expert as you can find to  
12 do the various jobs that have to be done. But it still  
13 is that experiment?

14 A That's right and I hope  
15 that it is monitored properly so that any comparable  
16 developement in the future, we will have a better  
17 baseline for assessing what might happen. This is one  
18 of the difficulties, I think, up until now is that  
19 people haven't sufficiently monitored developments in  
20 the Arctic.

21 We have the example of the  
22 Dempster Highway for instance, a large scale development.  
23 What do we know about it? What happened as a result  
24 of the construction of the Dempster Highway?

25 THE COMMISSIONER: You have  
26 brought this matter up on a number of occasions Dr.  
27 McCart, the impact of the Mackenzie Highway so far as  
28 it has gone and the/<sup>impact of the</sup> Dempster Highway. There is an  
29 implied rebuke there to the Federal Government and it  
30 may very well be quite justified.



1  
2 In these studies so far carried  
3 out by the Federal Government, you felt they were  
4 some but they had been classified as internal  
5 working documents so they had not been made available  
6 to you and your colleagues who were advising Arctic Gas.

7 If they were, if you were  
8 confident of the existence of some reports within the  
9 Department of Public Works or the Department of  
10 Environment or Indian Affairs and Northern Development,  
11 wherever they are.

12 If they were available to you,  
13 do you think they would be of substantial assistance  
14 to you in predicting the effect on fish, the fishery  
15 throughout the North, of building a gas pipeline?

16 MR. MARSHALL: Sir, before Dr  
17 McCart answers that I should mention that Dr. Fyles  
18 spoke to me and he said that he believes that these  
19 reports can be, or are now public and so he has asked  
20 that I check the list of reports that we would like to  
21 obtain to see if they haven't been included in these  
22 recent lists of government reports and it has indicated  
23 that if we can't get them, can't find them on those  
24 lists, we ought to speak to him about it. So, I thought  
25 in fairness to Dr. Fyles, I should just mention that.

26 MR. BAYLY: This informal  
27 swapping is working already Mr. Commissioner.

28 THE COMMISSIONER: Well that's  
29 fine. We are all aware of the uses of Dr. Fyles in this  
30 inquiry. Leaving that aside for a moment it looks as if



1  
2 we will be getting these things.

3 A I, incidentally  
4 was thinking of the section of the Dempster Highway  
5 to the west of the Mackenzie River. Now, there is some  
6 information available of that section which would  
7 probably be incorporated, in a large part as part of  
8 the Mackenzie Highway, east of the Mackenzie River.

9 But to my knowledge there  
10 have been no detailed monitoring of what has happened  
11 to populations of fish or benthic invertebrates in  
12 that section which has been completed and has been  
13 completed for several years. It was an opportunity  
14 to look at these things. Now, there has been a tendency  
15 I think to; there have been a few problems with the  
16 Mackenzie Highway, culvert problems and things like  
17 this and these have been studied and there is some  
18 information available on these things.

19 But see, what has happened is  
20 that people have tended to study extreme examples of  
21 disruption rather than look at the average condition,  
22 what is the average result, what is the average result,  
23 what is the ordinary stream, how has it been affected by  
24 these developments and that is the kind of information  
25 that I would like to have available.

26 Q Yes, I see your point. Well  
27 I am glad that Dr. Fyles is on the track of these  
28 documents. Well how are we doing Mr. Bayly?

29 MR. BAYLY: I think I am doing  
30 well Mr. Commissioner but I am not nearly finished.



1  
2 I am just, I am in your hands sir. I can go on, I can  
3 start again tomorrow, whatever you wish.

4 THE COMMISSIONER: Well, I  
5 think we should adjourn now and start again at 9:00 in  
6 the morning so--

7 MR. MARSHALL: Sir, I was  
8 just wondering if Mr. Bayly and Commission Counsel can  
9 tell me if there is any possibility of them wanting  
10 Dr. Gunn. Are they going to stick with the fish.

11 THE COMMISSIONER: Well, I think  
12 in fairness to Dr. Gunn we should excuse him and  
13 certainly sir we won't require you tomorrow and we'll  
14 look forward to seeing you on the week of December the  
15 2nd.

16 (WITNESSES ASIDE)

17 (PROCEEDINGS ADJOURNED TO NOVEMBER 21, 1975)  
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